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Heating and Ventilation

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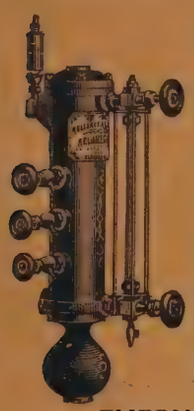
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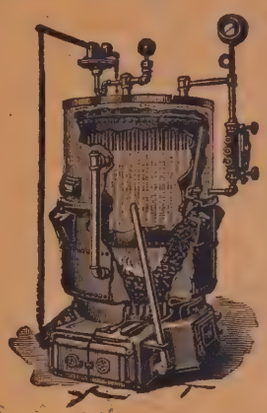
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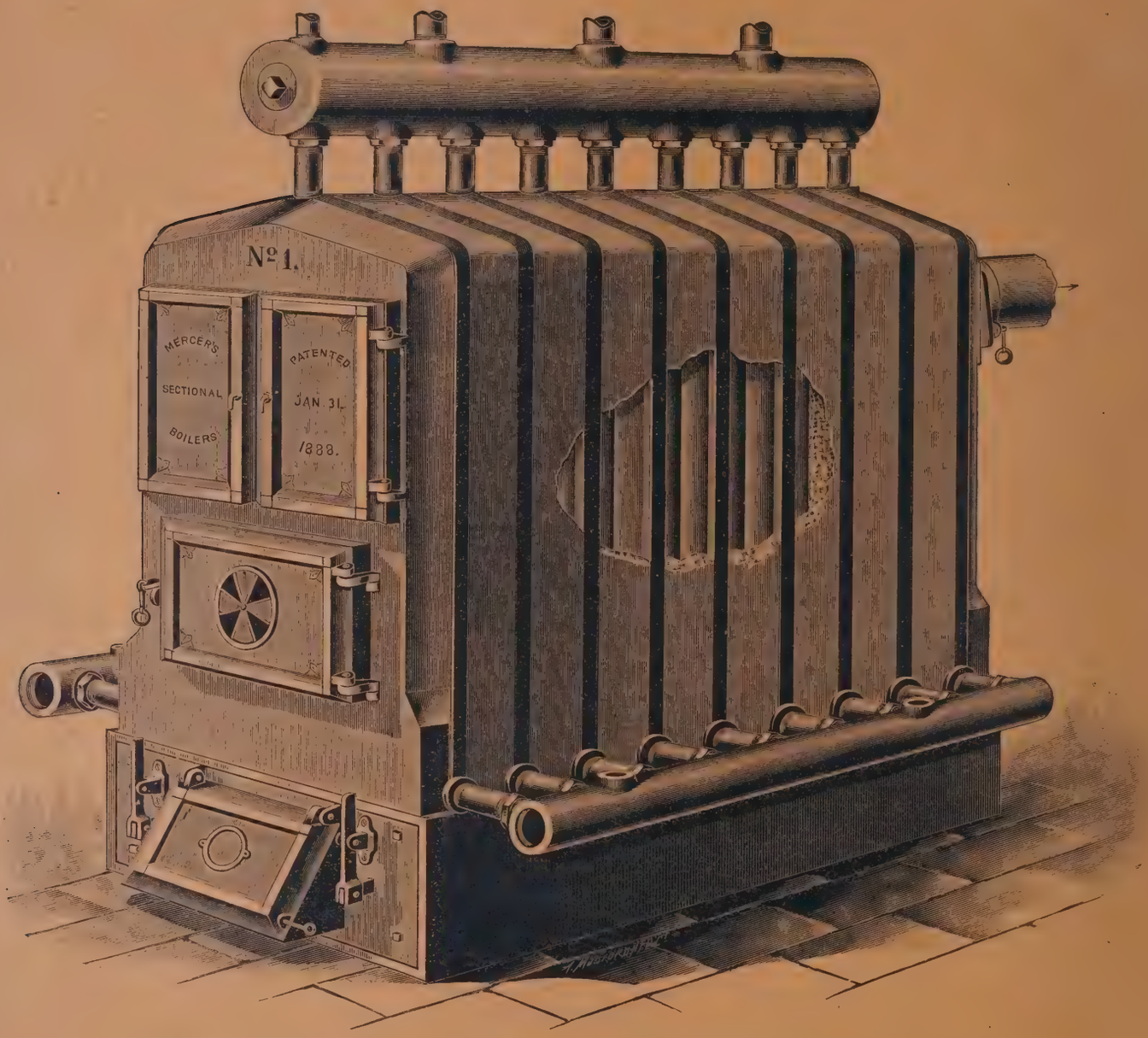
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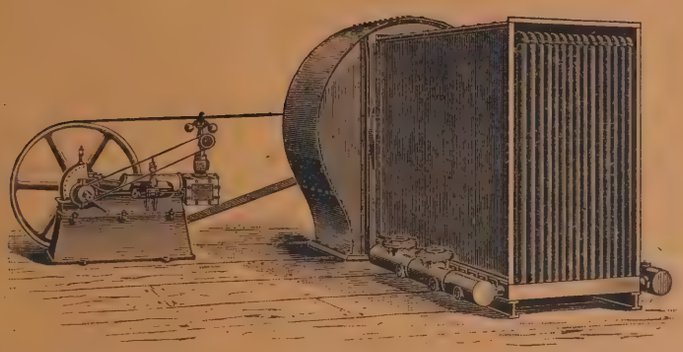
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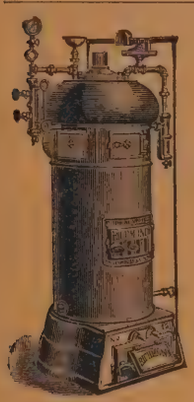
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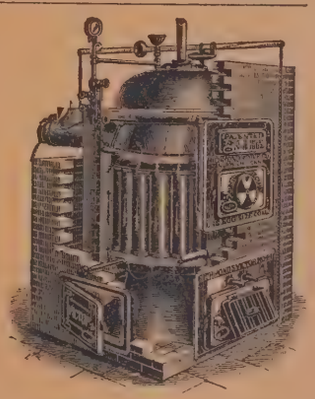
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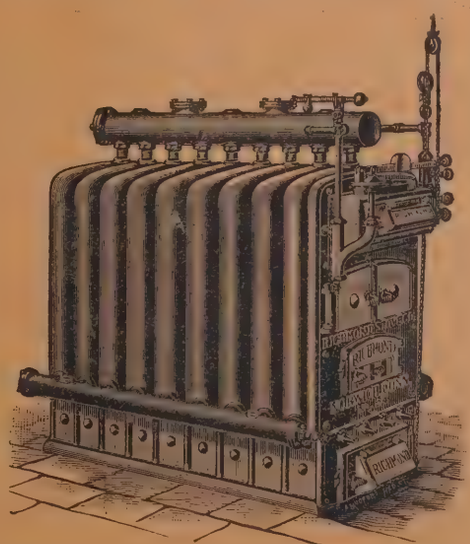


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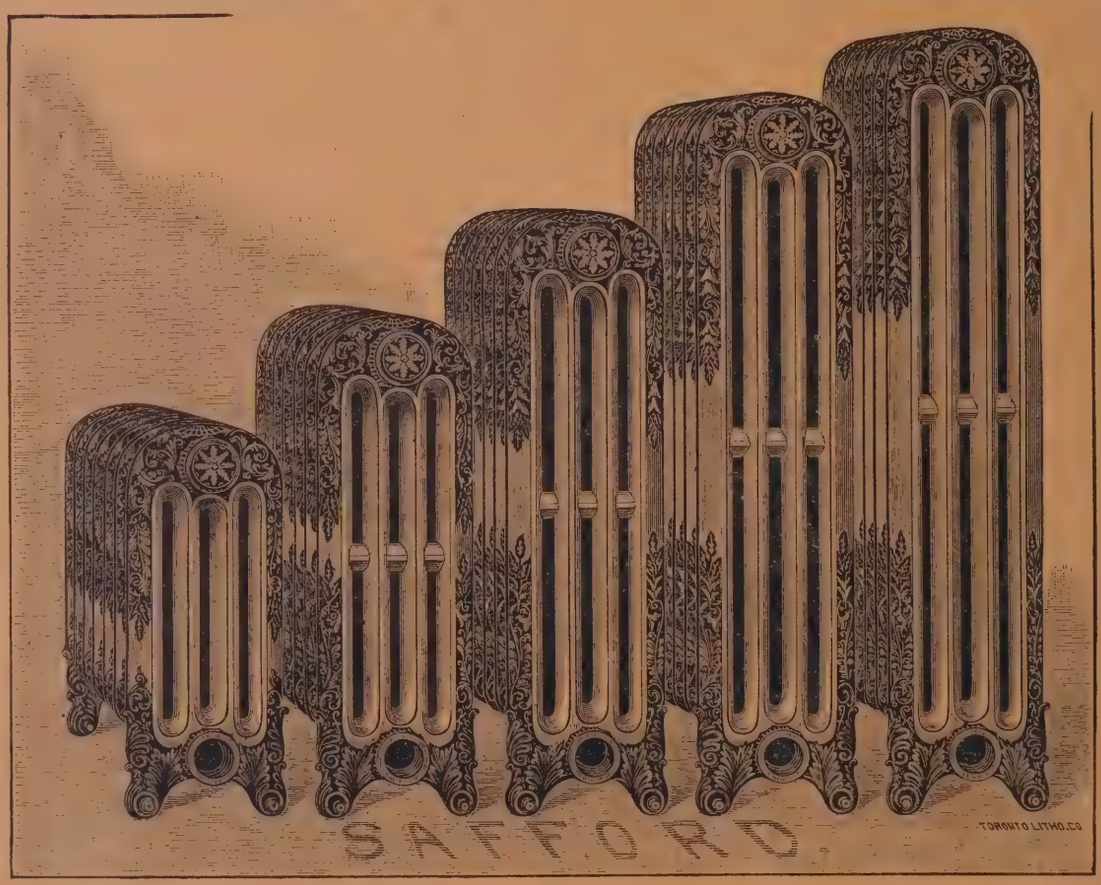
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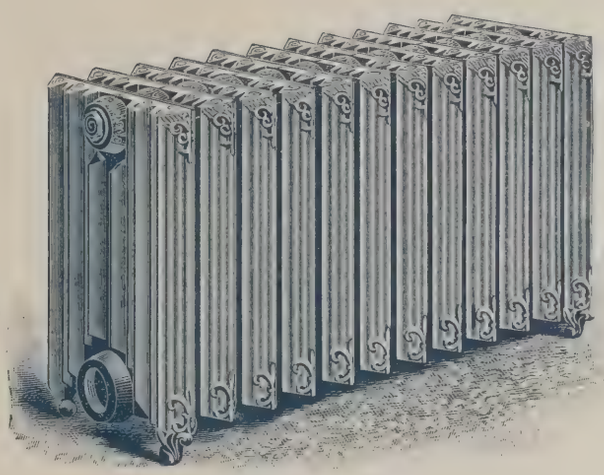
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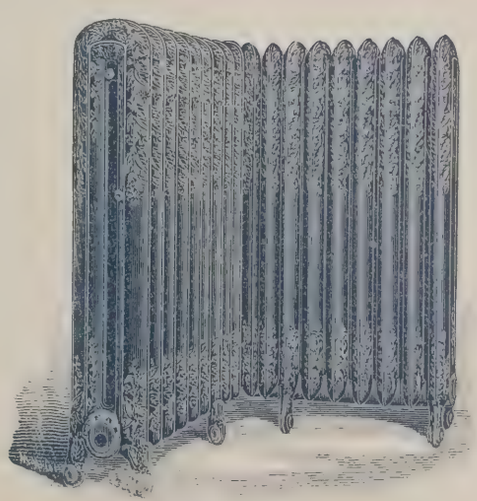
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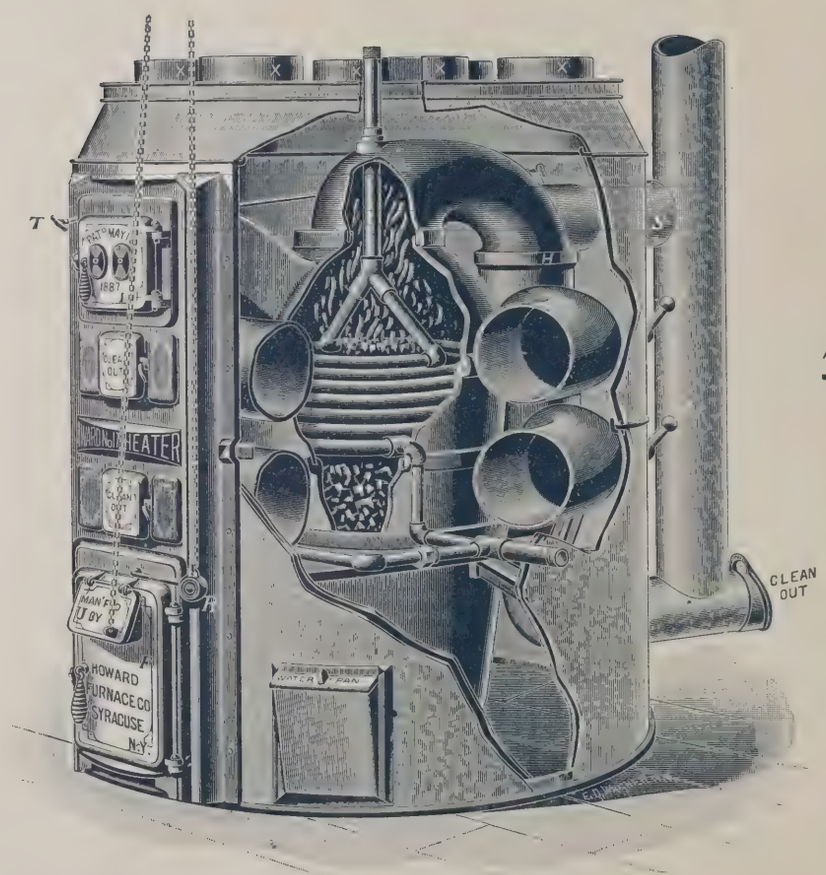
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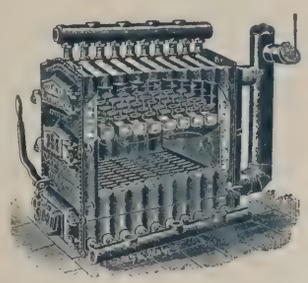
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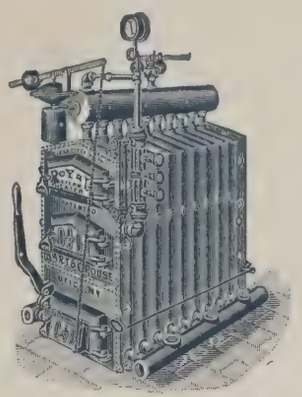
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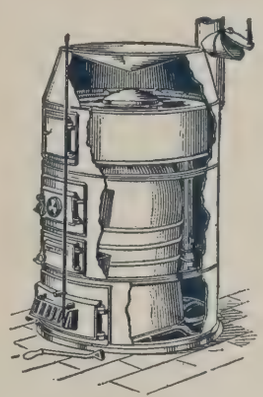
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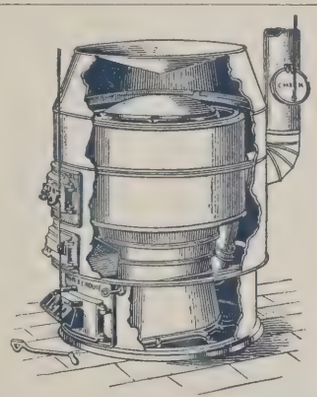
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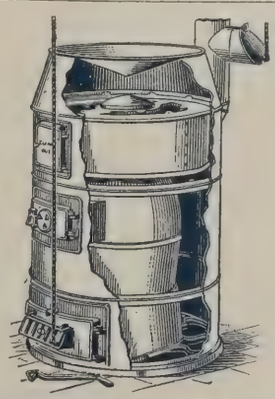
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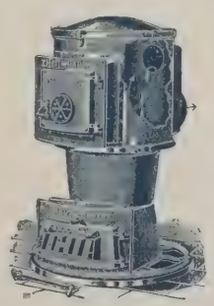
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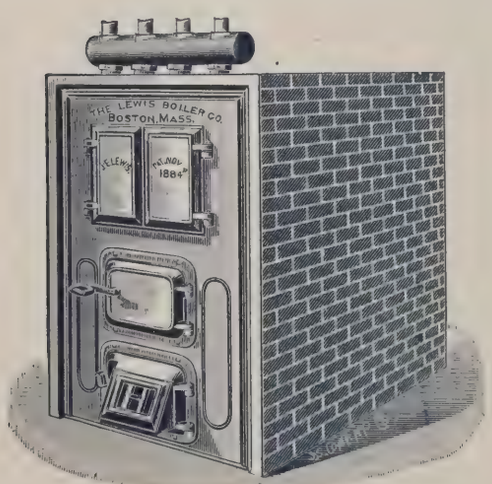
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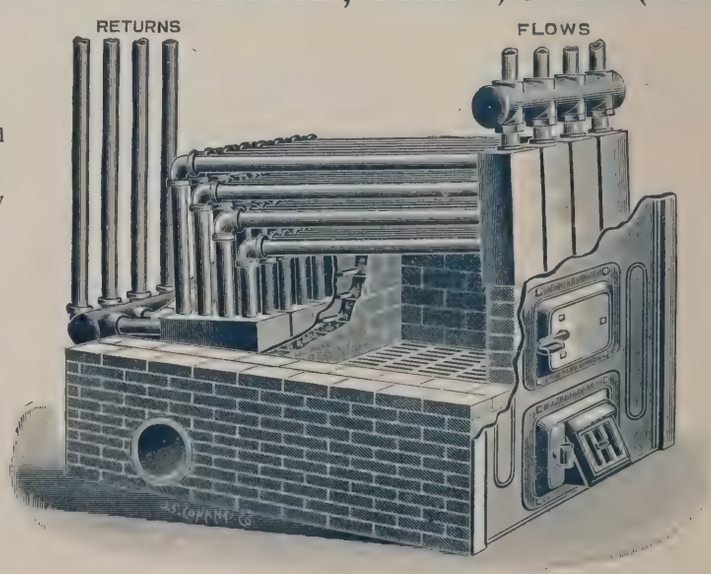
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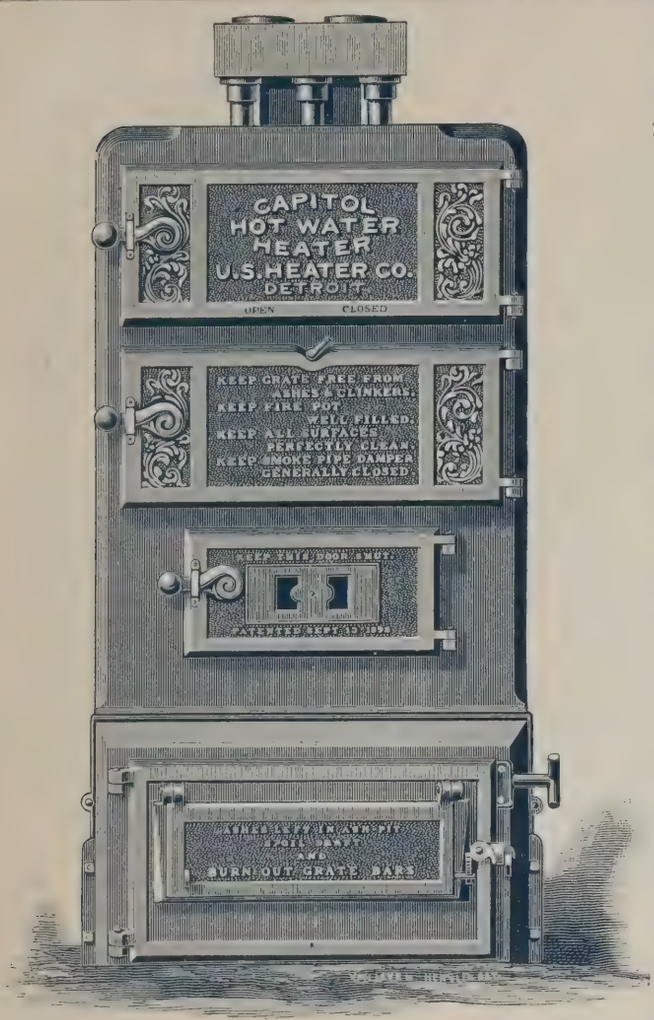


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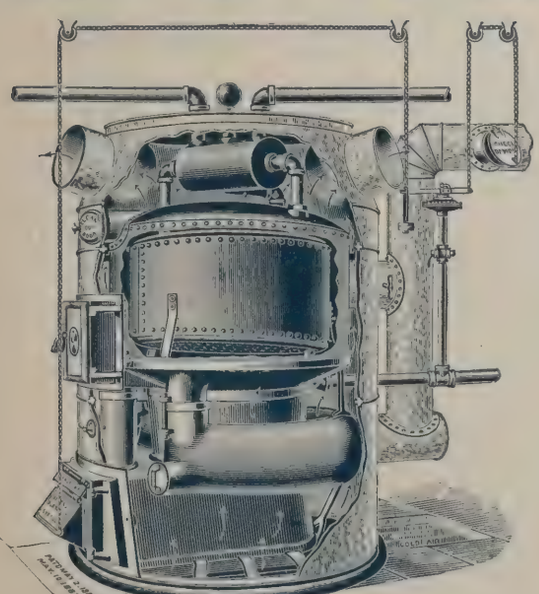
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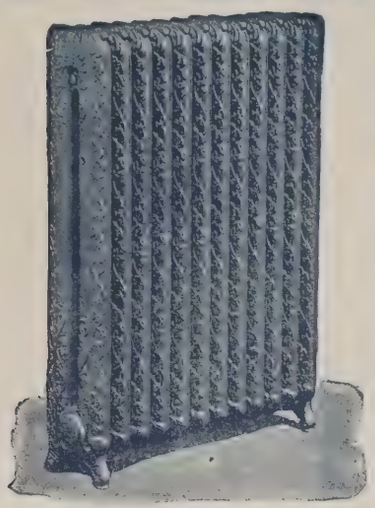
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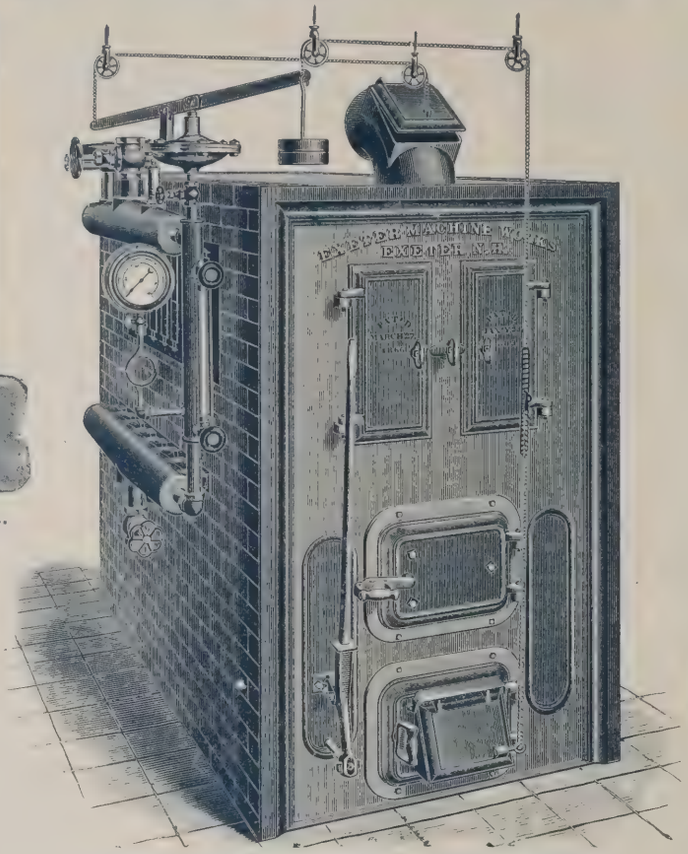
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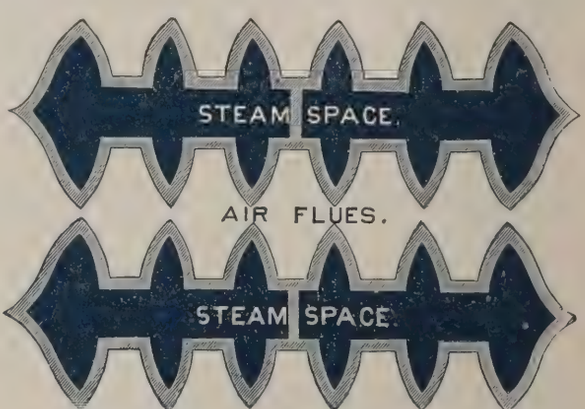
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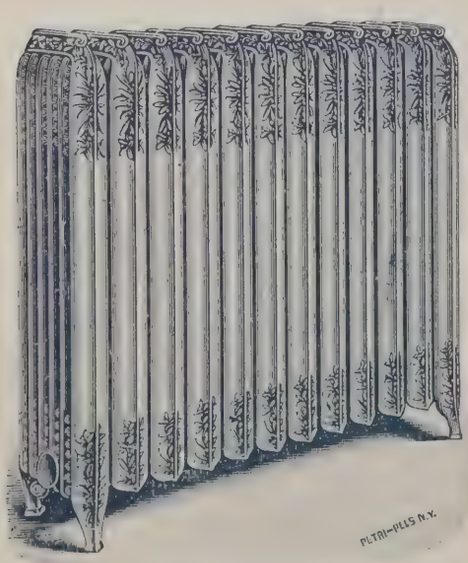
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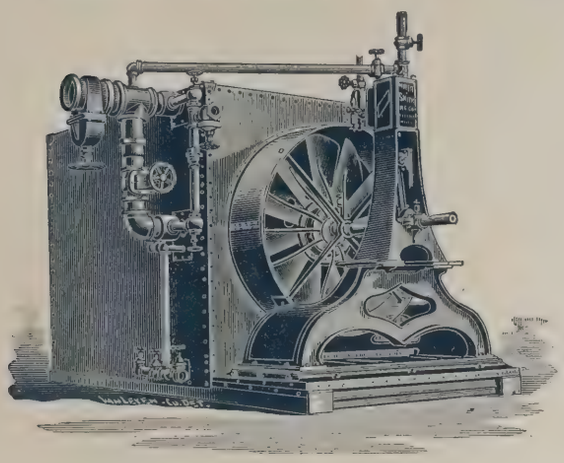


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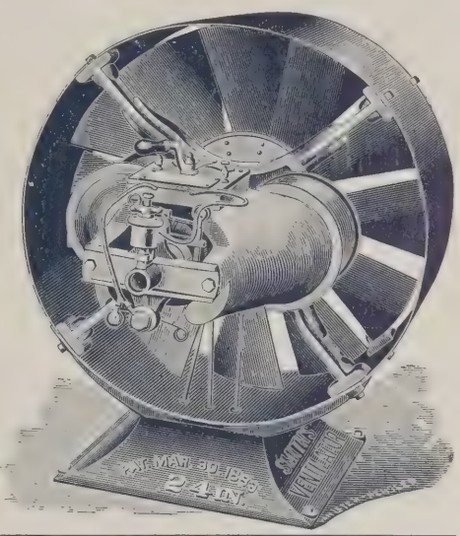
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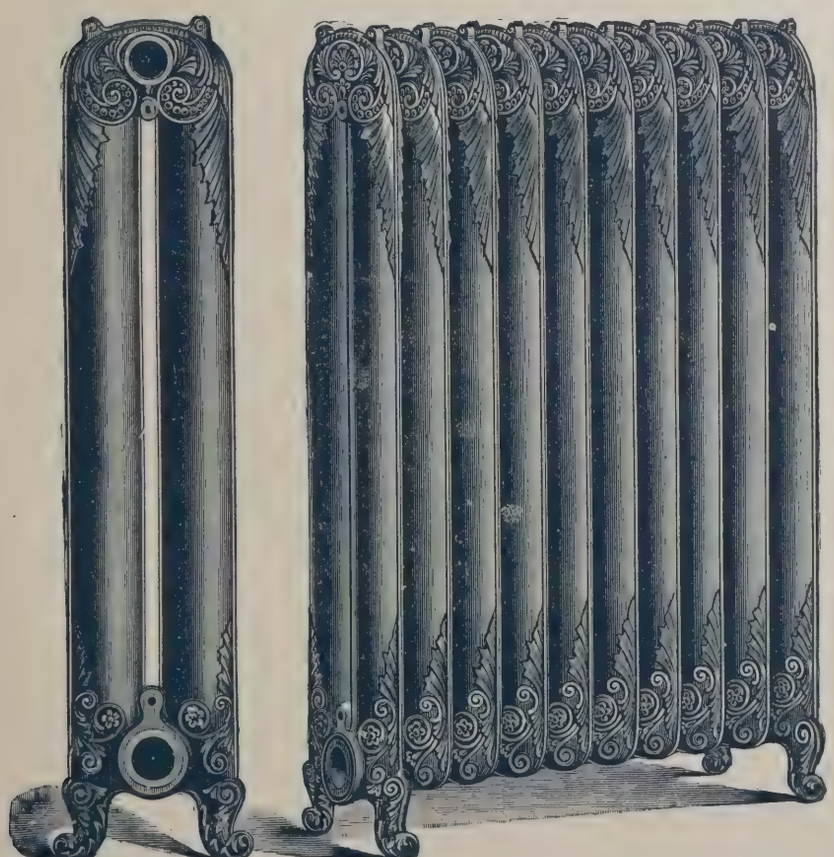
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Heating and Ventilation

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Modern Radiators.



IMPORTANT as one of the chief features of any heating system, radiators in relation to their construction and efficiency are of interest not only to the manufacturer but to the contractor, and especially to the heating engineer, who, basing his calculations on the asserted square feet and the supposed value of the radiating surface, which may fall short in actual use, is sometimes called upon, and generally at a loss, to make good the deficiency.

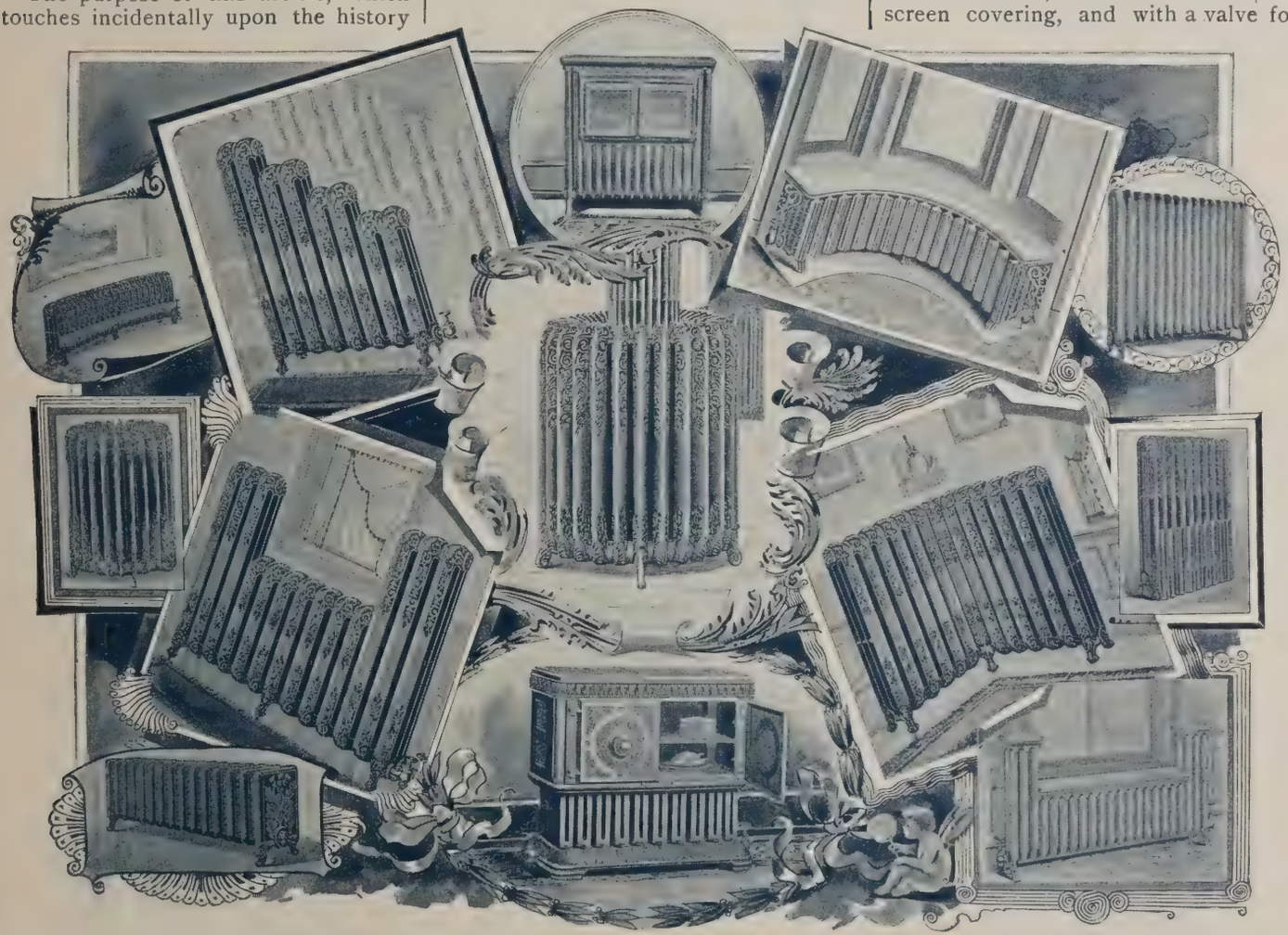
The purpose of this article, which touches incidentally upon the history of radiator manufacture, is to briefly describe the product of all the radiator manufacturers in the United States and Canada, and to show, by the cut on this page, the applications of the modern radiator, and its modifications in form to suit the circumstances under which it is used.

Radiation in its early form was in the shape of wrought iron tubes screwed into solid bases and connected at the top by means of return bends. With the advent of low pressure heating, however, and later of hot water heating, a demand was created for different radiators and more ornamental surfaces than were possible with wrought iron pipes and solid bases. Besides the objection to the old style of solid bases, there existed the desire to reach the sectional construction, and also to escape the clumsy feature of the screen cap or covering of all the wrought vertical tube and horizontal pipe radiators.

The early forms of cast iron direct and indirect radiators, which are said to have given higher results in heating power than any cast iron radiator of modern construction, were of homely design and were known as the Ox-bow and the Wash-board. They were generally made in single castings, to which simple form their high efficiency was due. The Wash-board radiator was made in halves bolted together,.

These early radiators, however, were not constructed to stand much pressure, and the joints, which were made with rubber packing, gave much trouble by leaking. Besides this the radiators were expensive to construct. To avoid both of the above difficulties, it was sought to avoid joints altogether by making a complete radiator at a single casting, and, by giving the tubes a peculiar form, to secure strength, lightness, and grace, besides reducing the cost of manufacture. The radiator in which this was attempted was patented by John H. Mills in 1873, but the pattern did not go beyond an experimental stage, though the matter was again taken up in 1877, resulting in a form of radiator in which the main idea was that of securing a direct sectional radiator, without a base and screen covering, and with a valve for controlling the heat as a part of its construction. The joints were at the center, a regular screw-threaded nipple being inserted and the bars or sections being screwed up the same as any other fitting.

Without attempting to follow the progress made in the manufacture of radiators, or to describe those which



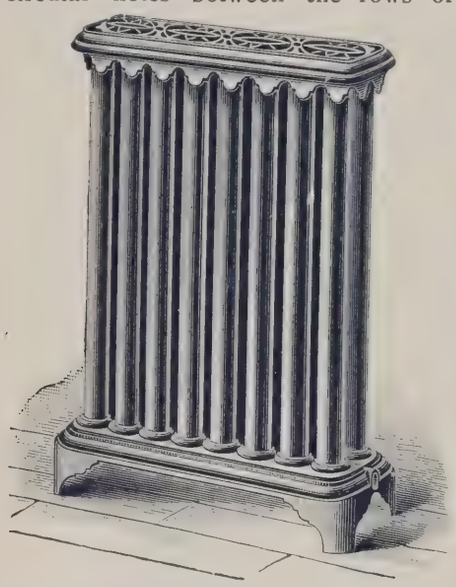
THE MODERN RADIATOR, ITS MODIFIED FORMS, AND THEIR APPLICATION.

followed the one last mentioned, it will suffice to say that gradual improvement led up to the general form which is now so common.

Wrought Iron Radiators.

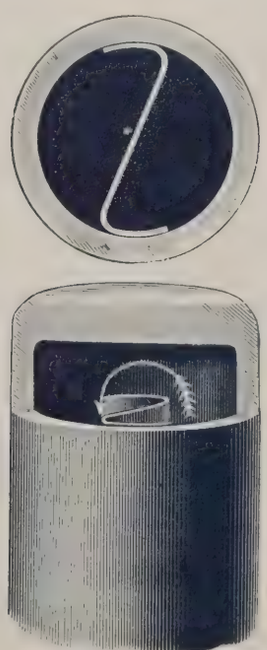
NASON RADIATOR.

The original pattern of Nason's vertical wrought iron welded tube radiators has been improved, as illustrated by the accompanying cuts, the new pattern radiators being styled Nason's Improved. The principal improvement is in the form of the base, which is so constructed as to admit air through circular holes between the rows of



NASON RADIATOR.—FIG. 1

pipes. By this arrangement the inner rows of pipe are said to be rendered almost as active as those on the exterior, and less surface than has commonly been used in the past can be employed in a room of given size. Being of wrought iron a distinct advantage is offered of making the radiators of any height required, within a fraction of an inch, and as all tubes are cut to a standard thread they may be



FIGS. 2 and 3.

readily removed from the base and the height changed if desired. Fig. 1 shows a small size two row radiator. Fig. 2 shows a horizontal section of a standard tube, with the form of diaphragm, used to secure an active circulation, and its method of insertion. It fits the tube closely, dividing it into two parts as efficiently as if there were two tubes connected at the top by means of a return bend. Fig. 3 shows that the diaphragm is driven nearly to the end of the tube, the space left being sufficient to permit of the easy passage of steam or air over it. The diaphragms are not liable to rust. The original scale on a number of them which were in use for 25 years, and which can be seen at the office of the manufacturers, the Nason Mfg Co., 71 Beekman street, New York, has been but little attacked. The radiators are made in several styles and sizes for direct, indirect, and direct-indirect heating. Each tube of regular height, with its proportional part of base, measures fully one square foot of surface.

Cast Iron Radiators.

AMERICAN RADIATORS.

Space does not permit of a detailed description of all the radiators classed under this general heading. They are known to the public as the Detroit,



FIG. 1.



FIG. 2

National, Ideal, Perfection, Peerless, and Excelsior, the first four of which are shown by Figs. 1, 2, 3, and 4. They are made in all styles and sizes, for both steam and hot water heating. The direct steam radiators are provided with bottom nipple connections, while those for hot water have both top and bottom connections and removable plugs in the end sections, so that the radiators may be used on the overhead system of piping. Circular or column radiators, window radiators, dining room radiators, stairway radiators, flue



FIG. 3.

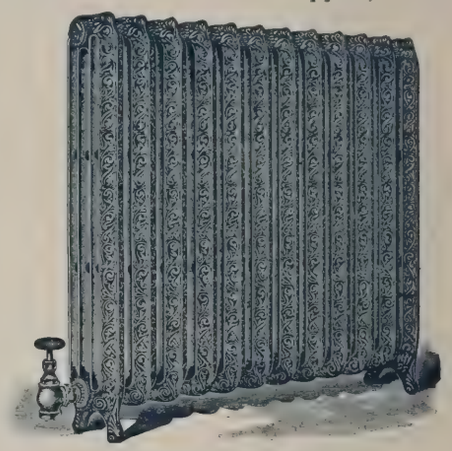


FIG. 4.

radiators, and many other modified forms, besides radiators for indirect and direct-indirect heating, are also made by the manufacturers, the American Radiator Company of Chicago and New York.

ERIE RADIATOR.

In this radiator, which is designed for hot water and steam, the loops are connected both at the top and bottom by specially constructed, extra heavy, right and left nipples, by which the loops are drawn face to face and held firmly in place, the faces or bosses of the loops being milled perfectly smooth and true. The right and left nipples used are operated from the inside by wrenches interlocking with projections cast on the inside of the nipples, which

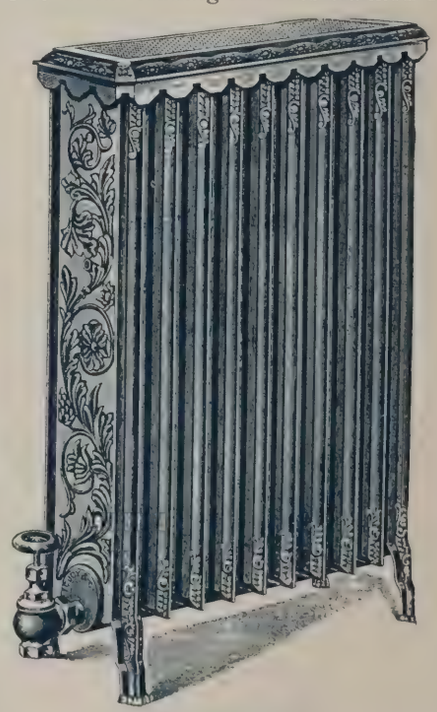


ERIE RADIATOR.

were patented in 1886. The end sections have openings at the top and bottom, so that the radiators can be used for either the under or overhead system of hot-water heating. The loops or sections consist of four connected tubes connected by two passages, forming direct connection with each tube. The radiator is made in various forms for use in corners, under windows, in stair halls, dining-rooms, etc., and also for direct-indirect heating. The Jarecki Manufacturing Co., Erie, Pa., are the manufacturers.

JOY FLUE RADIATORS.

The firm of T. C. Joy & Co. claim to be pioneers in the manufacture of radiators of the flue type. The accompanying cut illustrates their vertical flue radiator. They also make the Crescent, Crescent Window and Areal School. These are all flue radiators. One of the leading features claimed by



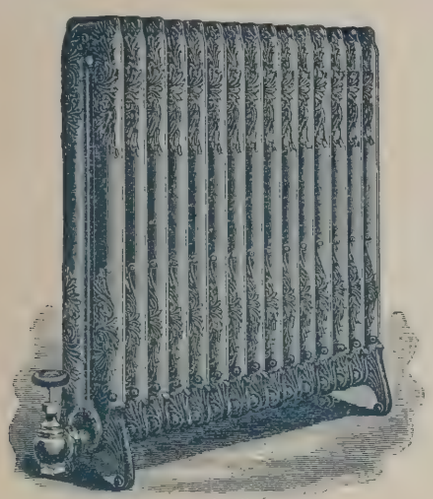
JOY RADIATOR.

this firm is their economy of floor space. The radiators are so constructed that the steam or hot water chambers are reduced to the minimum area and

the hot air flues are increased proportionately. The firm also manufacture the Orient, which is of a beautiful design and an improvement upon the loop type. Their New York office is 48 Centre street; Chicago office, 96 Lake street. They manufacture at Titusville, Pa. At all of these points the various styles of radiators can be seen.

SPLENDID RADIATOR.

The radiator shown in the accompanying cut is made in plain and ornamental styles for steam and hot water. The sections are connected together by means of slip nipples, making what is known as a "thimble" joint. The radiator is made in various sizes, with sections 7½ inches wide. It is guaranteed by the manufacturers, the Harell Steam Heating Co., Dun-

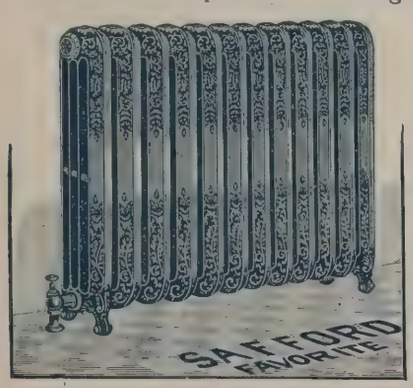


SPLENDID RADIATOR.

kirk, N. Y., to be perfect in every respect, free from leaky joints, bad castings, etc.

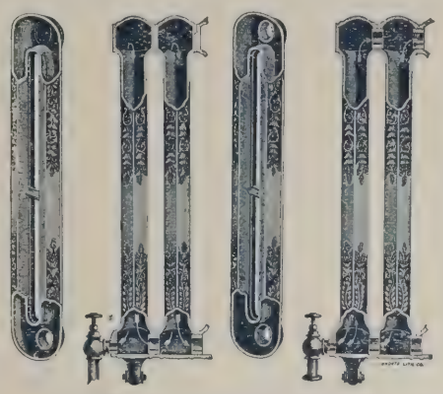
SAFFORD RADIATOR.

The Favorite pattern of Safford radiators, shown in Fig. 1, contains 12.37 gallons of water per 100 square feet of heating surface. The castings are ⅛ of an inch thick and are made of equal thickness throughout. The sections are connected by means of right and left nipples as shown in Fig. 2, the engraving to the right showing the bottom nipple connection of loop of steam radiator, and the one on the left showing the top and bottom connection of loop of water radiator. On the inside of each nipple are heavy lugs, so that with a piece of wrought



SAFFORD RADIATOR.—FIG. 1.

iron flattened out at one end, and inserted in the radiator at the joint to be disconnected, one or more loops can be taken out independent of the others. The makers state that they are the original manufacturers of four-loop radiators and radiators constructed without the use of base and

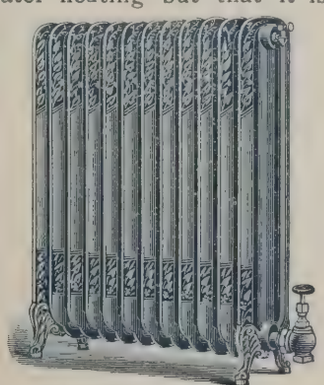


SAFFORD RADIATOR.—FIG. 2.

tops, Mr. Clarence E. Safford, of Titusville, Pa., being the inventor. The Toronto Radiator Mfg. Co., Ltd., 366–376 Dufferin street, Toronto, Ont., are the manufacturers. This company also manufacture radiators known as the Daisy, Perfect, and Provincial. Besides these they also make column, window, stairway, and other radiators in various styles and sizes. They also furnish radiators with any of the various styles of connections, such as twin (or double), top and bottom same end, single connection opposite end, opposite end top and bottom, and single pipe, with or without diaphragms, and with special valve attachments if necessary. Safford radiators are made plain and ornamental.

STANDARD RADIATOR.

The manufacturers of this radiator state that it was specially designed for hot water heating but that it is sur-

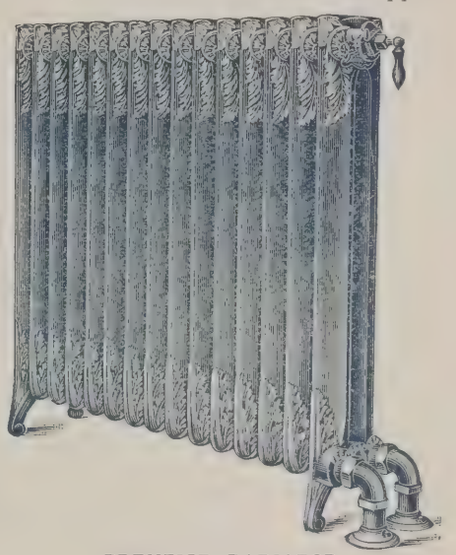


STANDARD RADIATOR.

passed by none for steam heating. It is of simple construction, with tight joints formed by slightly tapering connecting nipples. It has a large radiating surface in proportion to the water carried, and the full measurement of heating surface claimed for the different size sections is fully guaranteed. The radiator is made in a number of different sizes by the Standard Radiator Co., Buffalo, N.Y.

PRENTICE HOT-WATER RADIATOR.

The principal features of this radiator, which is designed for hot-water heating only, are a construction which enables the supply and return pipes to be connected both at one end or at opposite ends as usual, and the position of a special quick opening valve at the top. The sections are connected in the usual way at the top and bottom by screwed nipples. One end section is made with three holes, one or two of which must be sealed with plugs according to the manner of connecting the radiator to the circulation pipes. The top of the end section is tapped to receive a stuffing box through which passes the stem of a hollow cylindrical valve which fits easily in a sleeve which is screwed into the stuffing box, so that the whole arrangement can be inserted complete at once, and is commanded by the quick working handle shown in the cut When the valve is open, the ports of the valve cylinder register with corresponding ones in the sleeve and permit the water to circulate, but by turning the handle 90 degrees in a vertical plane the valve ports are carried entirely beyond those in the stationary sleeve, so that all circulation is stopped.



PRENTICE RADIATOR.

This radiator is manufactured by the L. H. Prentice Co., 203 and 205 Van Buren street, Chicago, Ill.

FAVORITE RADIATOR.

A simple nipple joint for steam, with usudurian packed top joint for hot water, is used in the manufacture of this radiator, which is shown in the accompanying cut. The manufacturers claim that these joints are more easily and quickly taken apart and put together, and more durable and easily repaired than any other joint now in use. The sections are made of the best cast iron, and are guaranteed to be free from leaks and other defects.

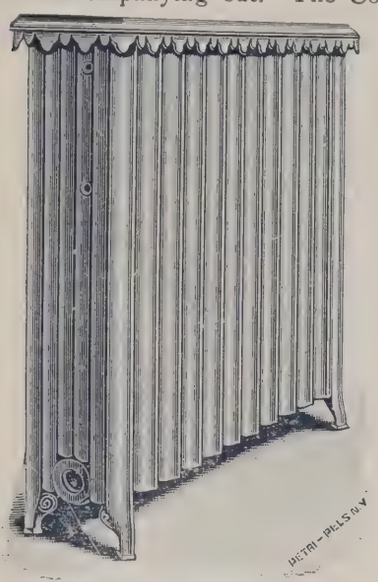


FAVORITE RADIATOR.

The heights and capacities of both steam and hot water radiators are the same. The M. Steele Co., Springfield, O., are the manufacturers.

CORRY RADIATOR.

The special feature of the construction of all the radiators manufactured by the Corry Radiator Co. of Corry, Pa., is the application of the flue principle, with all prime surface. The radiators are constructed of corrugated or hollow ribbed sections placed side by side in such a manner as to form a series of vertical flues or air passages between the sections. The Hercules pattern is entirely without ornamentation, as shown in the accompanying cut. The Corry

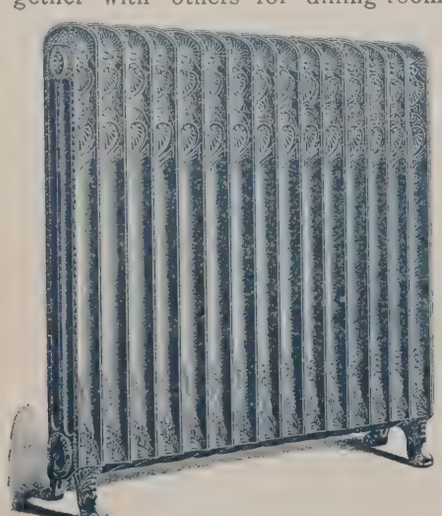


HERCULES RADIATOR.

company manufacture the following besides the Hercules: Gem, for steam and for water; Leader, for steam and for water; Pearl, for steam only; and window radiators for water or steam.

BUNDY ELITE RADIATOR.

This radiator is made for steam and hot water heating, and, as shown in the engraving, is handsome in design. The sections are connected top and bottom by means of threaded nipples, and the end sections are provided with removable plugs so that the radiator may be used on the overhead system of piping. Besides the Bundy Elite the manufacturers make the Bundy Columbia, Bundy Pyro, Bundy Princess, Bundy Renaissance, Bundy Standard, Bundy Duplex, and Bundy Semi-Duplex radiators, together with others for dining rooms,

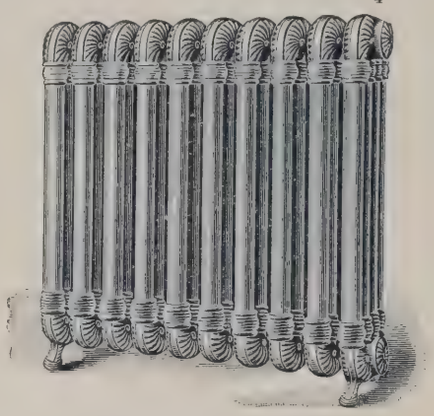


BUNDY ELITE RADIATOR.

windows, etc., and direct-indirect and indirect heating. The A. A. Griffing Iron Co., Jersey City, N. J., and 14 Dey street, New York, are the manufacturers.

CONNECTICUT RADIATOR.

The sections of this radiator consist of four tubes joined by heads which have free water passages. The two inner tubes have the same internal and external diameter as 1½-inch pipe, and the two outer tubes that of 1¼-inch

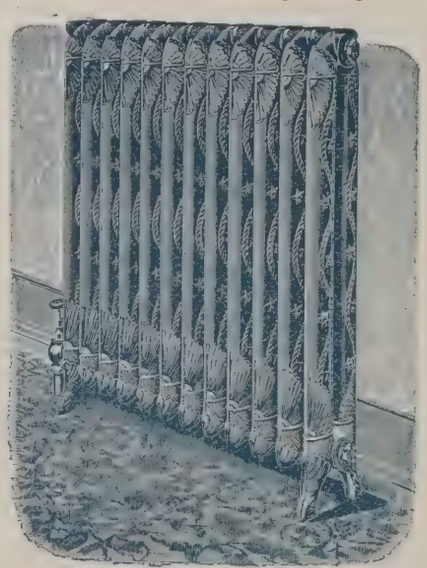


CONNECTICUT RADIATOR.

pipe. These tubes are assembled with a one-inch air space between them, permitting of a free circulation of air. In making up the joints, screwed iron nipples are used. This radiator is made in various sizes by the Hopson & Chapin Mfg. Co., New London, Conn.

KEYSTONE RADIATOR.

The loops of this radiator are connected at the top and bottom by malleable-iron threaded nipples, on which the threads are cut exactly at right an-

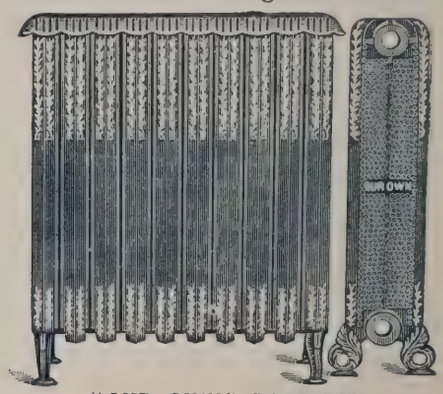


KEYSTONE RADIATOR.

gles to the planed shoulder of each loop, so that threads and shoulders are relatively true throughout. By changing the end plugs top or bottom connections may be made. The parts are all interchangeable, admitting of ready repair or change of size. As shown in the accompanying cut, the design is chaste and elegant, perfect symmetry being obtained by broadening the lower portion of the radiator, and thus overcoming the defect of looking top-heavy. John Maneely, 309–313 Arch street, Philadelphia, Pa., is the manufacturer.

"OUR OWN" RADIATOR.

In this radiator an attempt has been made to secure the advantages of a flue radiator and of a Gold pin surface by combining with the flue principle a surface augmented by Gold pins, as shown in the accompanying cut. Large openings are provided at the bottom and top of the flues for the admission of the cold air drawn from the floor and the discharge of the warm

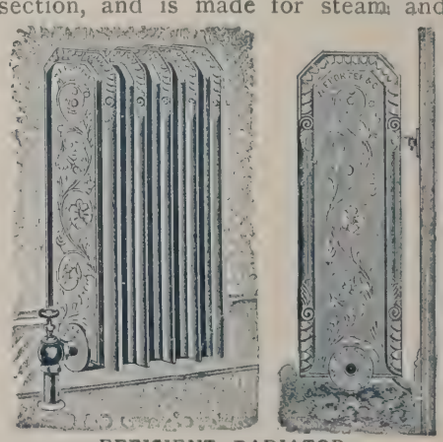


"OUR OWN" RADIATOR.

air. The makers state that the column of cold air coming in contact with the pin surface is thoroughly disintegrated and that the temperature and velocity of the air when discharged are very satisfactory. The radiator may be used for steam or hot water, and is made in various styles and sizes, for use in corners and for direct-indirect heating. Each loop of the standard height, 37 inches, contains 6 feet of heating surface. No packed joints are used, the loops being securely nippled together with heavy wrought iron nipples. Broomell, Schmidt & Co., York, Pa., are the manufacturers.

EFFICIENT RADIATOR.

A front and an end view of the Efficient vertical flue radiator on brackets are presented herewith. It is claimed that this radiator occupies the minimum of floor space, and that it is manufactured under original patents covering the only correct and scientific principles upon which flue radiators are made. The air entering the flues at or near the floor is discharged at the top of the radiator with a velocity, temperature, and volume at from 50 to 75 per cent above that obtained with ordinary direct radiation. The manufacturers state that the interior or flue surface is the best and most efficient portion of their radiator, while the interior surface of radiators not of the flue type is least valuable. The Efficient is 38 inches high, contains 7 square feet of surface per section, and is made for steam and



EFFICIENT RADIATOR.

water. The manufacturers, the Porter Radiator & Iron Co., Minneapolis, Minn., make several other radiators besides the Efficient.

EXETER RADIATOR.

The sections of this radiator, which are of the best gray iron, are connected by means of 2-inch malleable iron threaded nipples, the face of each section being milled smooth and true. Connection at the top of the hot water radiator can readily be made by removing the ornamental plug, so that the radiator may be used for the overhead system of piping. The Exeter radiator is made in three styles—ornamental, semi-ornamental, and plain. The ornamental style is shown by the accom-

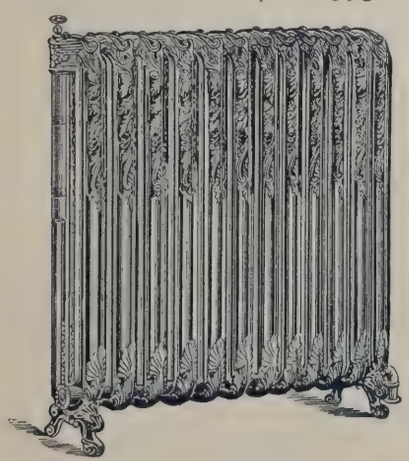


EXETER RADIATOR.

panying cut, the design being combined Byzantine and Ionic. Several modifications in form adapt it for use in stair halls, under windows, in dining rooms, etc. It is manufactured by the Exeter Machine Works, Exeter, N. H. Salesrooms, 32 Oliver street, Boston, Mass.

GURNEY RADIATOR.

The Gurney radiator has been specially designed and constructed for hot water heating purposes. It is novel in its method of operation, construction, and design. The water is introduced at the top, the purpose sought being to secure positive circulation by allowing the water to sink as its density is increased by parting with its heat, without being disturbed by ascending currents of heated water. The waterways being all open, and the surface of the radiator being correctly adjusted to the body of water it holds (viz., 13⅓ gallons

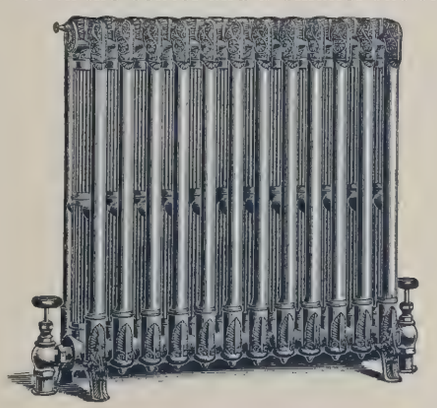


GURNEY RADIATOR.

per 100 square feet of surface), the circulation is more efficient than when connected at the bottom of the radiator. The conveying of water to the top of the radiator is an important feature in its construction. The valve being situated at the top of the radiator is very convenient for operating, and is not liable to get out of order. The radiator is made 2, 3, and 4 rows in width, 39 inches high, while the intermediate sizes 21, 27, and 33 inches high, are 4 rows wide only, the idea being that in a radiator it is desirable to have the largest amount of radiating surface in as small floor space as possible, consistent with efficiency. Thus the 4 row radiators are made in intermediate heights only. The radiators are tapped for flow pipe at the top, with interchangeable return openings at the bottom, by this means giving the fitter a choice of connection. The radiator is very ornamental, and is capable of a very large variety of decorative treatment. The surfaces are also so placed that they can be readily cleaned, and are made at such angles as to give the most effective transmission of heat into the room. The Gurney Hot Water Heater Co., 163 Franklin street, Boston, Mass., are the manufacturers.

ROYAL UNION RADIATOR.

The engraving below shows the Royal Union radiator, manufactured by the H. B. Smith Co., Westfield, Mass. The sections of this radiator are of a triple tube pattern, one larger tube in the center and a smaller one on

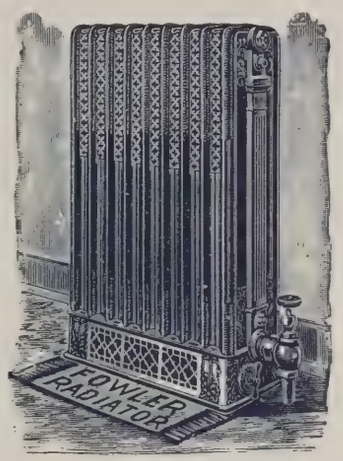


ROYAL UNION RADIATOR.

either side, securing an open construction and an arrangement of surface whereby the greatest amount may be made available for useful work. The joint between the sections is made by a smooth, taper, push nipple. This pattern is made for both steam and water warming, as well as the other patterns manufactured by this company, which are known as the Union, Union with ornamental base, the Imperial and Champion Union, the Whittier, and the Reed, which last radiator is used for steam warming only.

FOWLER RADIATOR.

In this semi-direct radiator the air admitted to the base is drawn upward into the spaces or flues between the radiator sections, the sides of which are provided with vertical flanges which project outward to form a main flue with a large opening at the bottom, so as to freely admit a maximum quantity of air. On the face of the sections are cast a series of short, oblique flanges, which by reaching out and meeting those on the next section, form a number of short, oblique flues. The closed vertical flanges at the sides of the sections extend upward only a sufficient distance to allow the currents of air to extract from the heated walls and flanges all the heat it is capable of receiving. Above this, fresh air is drawn in through the ornamental open work of the sides, so that no portion of the radiator is dormant. The openwork side flanges are detachable. The sections are connected at the top and bottom by lead coated nipples so arranged that the radiators may easily be taken apart. The bolt for drawing the

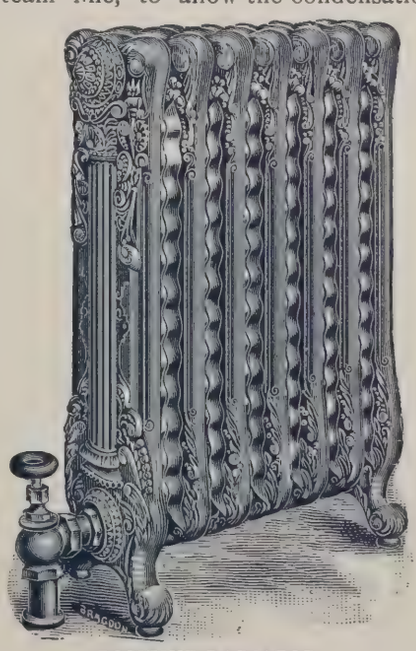


FOWLER RADIATOR.

sections together passes through sleeves cast in each section, and not through the steam spaces. The Fowler Radiator Co., 435 N. Broad street, Philadelphia, Pa., are the manufacturers.

POSITIVE RADIATOR.

This radiator is constructed on the flue principle but differs from others in that no air valve is required when the radiator is used for steam heating. This new feature is explained by the manufacturers, the Positive Radiator Co,. 21st St., and A. V. R .R., Pittsburgh Pa., as follows: "We first take the steam in at the bottom of the radiator and stop it at the second section with a baffle, which is provided with a waste below the steam line, to allow the condensation



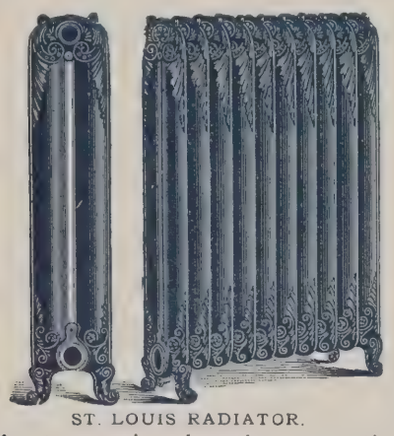
POSITIVE RADIATOR.

to escape back to the supply. The steam is carried to the top of the radiator through the first section and from there it is equally distributed in

the top of each section, and so brings the steam pressure on the top of all air and condensation. As a consequence what air there is becomes mixed with steam and in a measure superheated, and what condensation occurs escapes back to the supply." As shown, the radiator is very ornamental, and is made for direct and direct-indirect heating with steam or hot water.

ST. LOUIS RADIATOR.

This radiator is designed for steam or hot water heating. The right and left stud bolt by which the loops are held together can be quickly disconnected in case a leak is discovered,

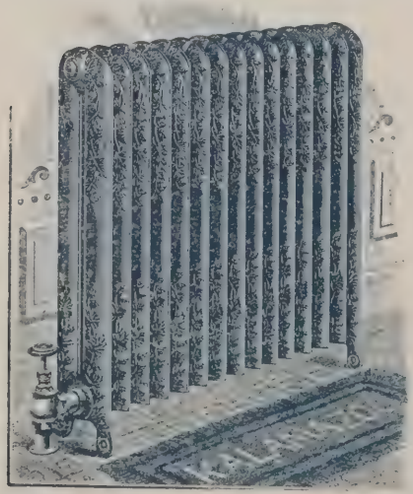


ST. LOUIS RADIATOR.

without removing the valve connection, thus avoiding the necessity and expense of ending up to be swung off loop by loop. But little time is required to take off or add more loops to the radiator, a feature that will be appreciated by the practical steam fitter. There are no nipples or screwed ends to come in contact with the steam or hot water and rust, and no paper gaskets or red lead are used, as the opposite faces of each loop are made male and female, with a Jenkins gasket between them. An ordinary wrench is the only tool necessary to connect or disconnect these radiators. The St. Louis Radiator Mfg. Co., 605[B], 606, 606[A], Union Trust Building, St. Louis Mo., are the manufacturers.

KALAMAZOO RADIATOR.

No bolts or packing are used in the construction of this radiator, which is manufactured for steam and hot water.



KALAMAZOO RADIATOR.

The sections are connected by means of threaded nipples, and by means of removable plugs in the end sections the radiator may be used for the overhead system of piping. The radiator is made in various sizes, the heights and capacities being the same for steam and hot water. It is manufactured by the Kalamazoo Radiator Co., Kalamazoo, Mich.

KENSINGTON RADIATOR.

The castings of this radiator are made of the best gray iron The sections are connected in the usual way



KENSINGTON RADIATOR.

by means of threaded nipples. As shown by the engraving, the design is such as to lend itself readily to decorative effects. The manufacturers claim broadly for these goods that they are standard, reliable, and will prove perfectly satisfactory in every respect. The manufacturers, the George P. Steel Iron Co., 1225 Betz Bldg., Philadelphia, Pa., also make the Grove radiator for steam or hot water.

HOLLAND RADIATOR.

The opposite faces of the sections of this radiator, which is shown in the engraving, are made male and female

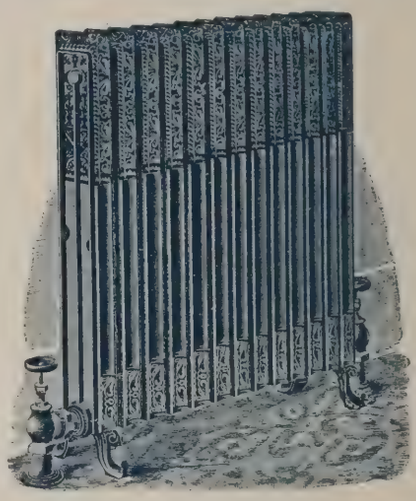


HOLLAND RADIATOR.

with a Jenkins gasket between them. The sections are held together by means of right and left stud bolts, which permit of easy repairing in case it is necessary. The size of the radiator may be very readily and quickly changed, the only tools required being an open ended wrench. It is manufactured in different sizes for both steam and hot water heating by the Holland Radiator Mfg. Co., 89 Lake street, Chicago, Ill.

ELECTRIC RADIATOR.

Each section joint of the radiator shown in the accompanying cut is threaded with taper threads, right hand taper nipples being used to hold the sections together. No packing is used between the sections, but the nipples,

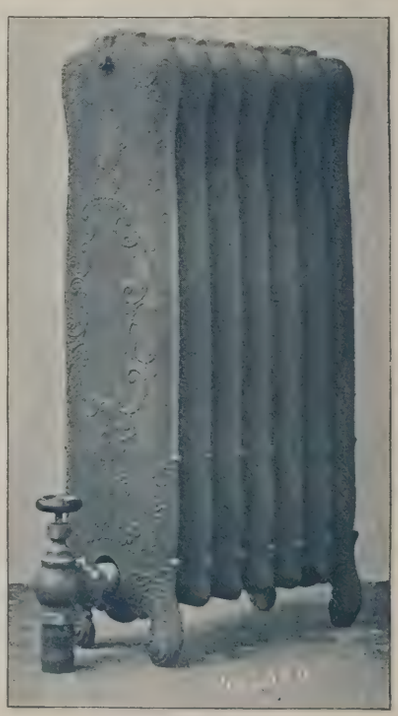


ELECTRIC RADIATOR.

which are $1\frac{3}{16}$ inches long, are tapered both ways, and when the radiator is screwed together under pressure perfectly tight joints are assured. This radiator, which is designed for steam or hot water, is constructed with a view of securing perfect circulation. It is manufactured by the Adams Radiator & Boiler Co., 441–457 N. Front street, Reading, Pa., who also manufacture another style of radiator called the Cyclonic, which does not differ materially in its construction from the Electric radiator.

NIAGARA RADIATOR.

The radiator shown in the accompanying cut is of the three column type with solid end loops, and combines several new and important features on which patents are now pending. It is made by the Niagara



NIAGARA RADIATOR.

Radiator Co., of Buffalo, N. Y., who manufacture a complete line of direct and indirect radiators for steam and hot water. As shown, this radiator is of a beautiful and chaste design.

A New Hot Air Furnace.

The accompanying rear-view sectional engraving shows one of the twenty styles of a new hot air furnace just brought out by the Fuller & Warren Co. of Troy, N. Y. Fig. 2 shows the furnace with steel dome and wrought steel reversible flue radiator. It is also made with a horse-shoe radiator, and with a steel dome with double feed doors for wood. The radiator of the furnace shown is of large size, and according to the calculations of the manufacturers adds nearly one-third to the heating capacity of the furnace. The smoke pipe collar extends through the casing, making it easy in setting up, a feature always appreciated by the rural tin-smith. The casings on these furnaces are very large, this being made necessary on account of their large heating capacity. The casings are fastened together by means of rings, a patent on the connections of which has been applied for. This connection is clearly shown in Figs. 1 and 3. The check damper shown in Fig. 4 is controlled by a chain from the room above, and is simple and original in construction. It is not liable to get out of order, and can be arranged for either perpendicular or horizontal pipes by merely renewing the cotter which fastens the arm on the damper and putting the arm back again at a quarter turn lower.

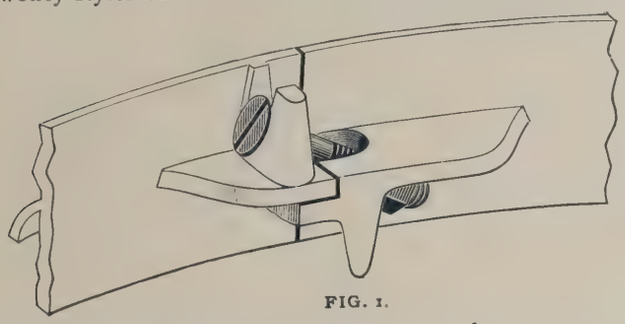


FIG. 1.

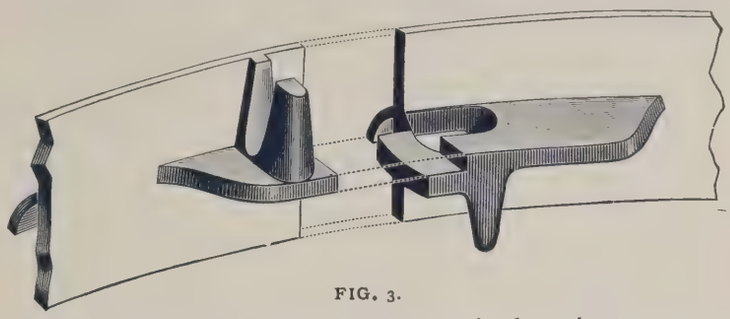
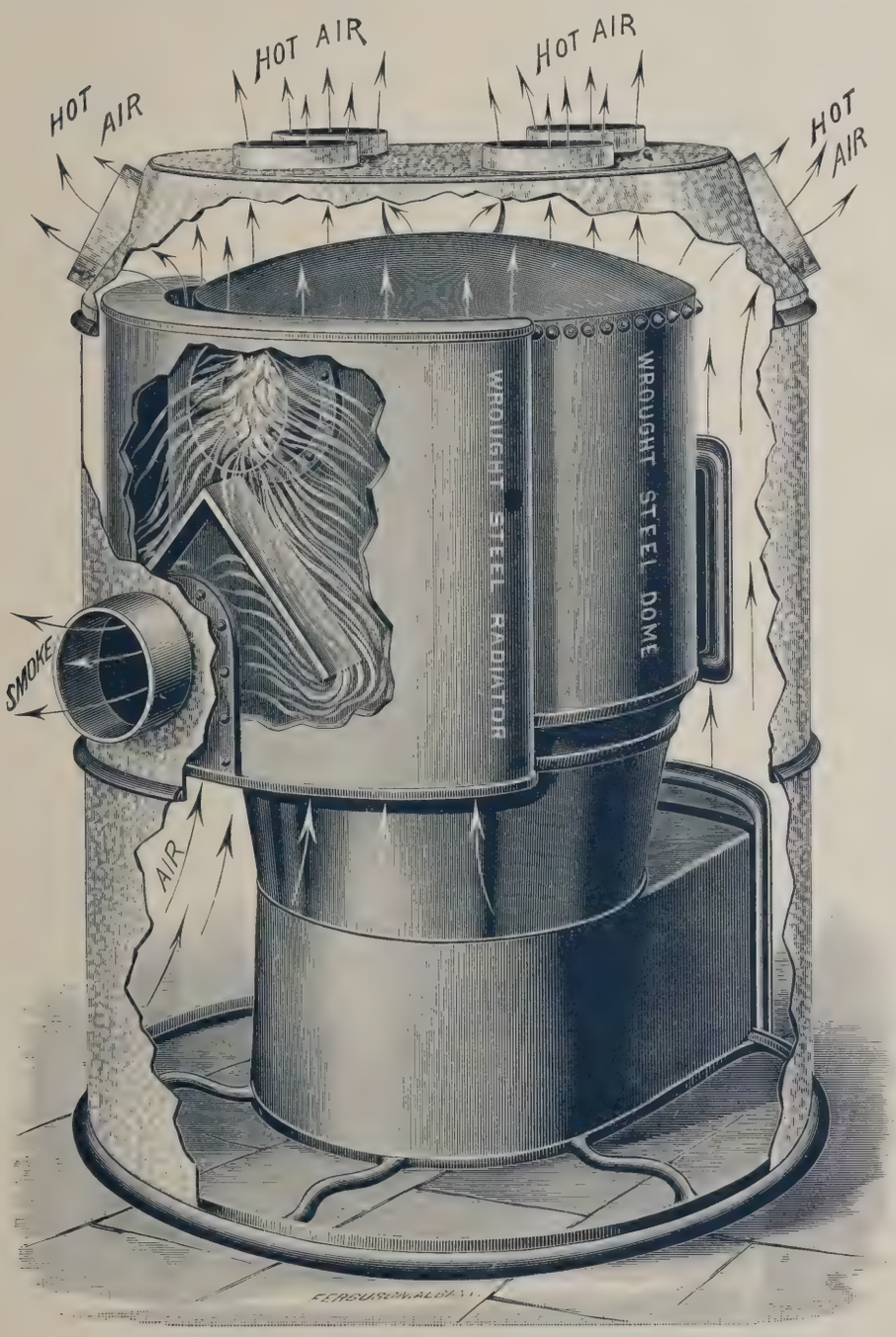


FIG. 3.



A NEW HOT AIR FURNACE.—FIG. 2.

A WRITER who is considered an authority on school house heating and ventilation says: Do not use "direct steam," or "direct indirect steam," so-called, in warming a schoolroom. The room may be warmed; but it will not be properly ventilated if either of these are used. Where indirect steam is used in some schools, two rows of steam pipe are placed around the outer or cold sides of the room. This is only intended to be used at night, or to warm the room before school is opened in the morning. Do not use this during school hours, as it interferes with the proper circulation of the air. After the room has been properly aired out by the indirect, after close of the session, the indirect can be turned off, the direct turned on, the outlet closed—except about three or four inches at the bottom—and a considerable saving of fuel made during the night. The room will be comparatively warm in the morning. The small opening left in the outlet will cause enough circulation to evenly warm the room. In the morning, after the room is sufficiently warmed, and before the commencement of the session, the direct should be turned off and not used during the session. When a direct radiator is used as an auxiliary heater, better results appear to be obtained when it is placed under the warm-air inlet, instead of on an outer side of the room.

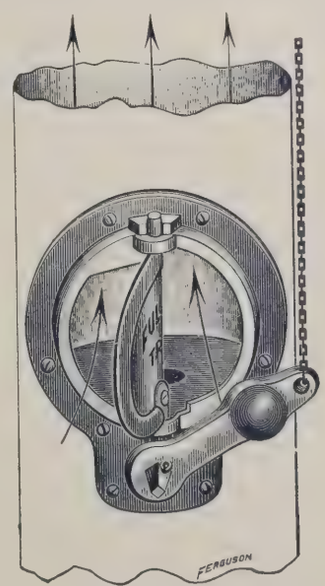


FIG. 4.

Heating and Ventilation of Residences.—III.*

James R. Willett

A hot-water heating apparatus may be likened to a circle, or rather, to two vertical columns of pipe, connected both at top and bottom so as to form a continuous conduit. If these columns are filled with water and one of them is heated, especially at or near its lowest point, the water in the heated column will ascend while that in the cold column will descend, the motive power being the difference in the weight of these columns. The difference in the weights of water at different temperatures below the boiling point is quite small, and therefore it is desirable for the apparatus to be adjusted so that the water in passing through it shall have as little friction as is practicable.

The boiler may be said to be placed at the lowest point of the heated column, and the heated column is the supply or feed pipe to the radiators, while the colder column is the return from the radiators to the boiler. The greater the difference between the temperatures of these columns the greater the motive force, and therefore the more rapid the circulation.

Fig. 1 illustrates the circulation of water in hot-water heating apparatus.

The radiators may be placed at any points of the circuit. The higher they are above the boiler the more rapid will be the circulation of the water.

Separate vertical sections or loops forming a hot-water radiator should be connected at both top and bottom so as to allow water and air to pass. The larger these connections the better.

Globe valves should not be used on hot water pipes as they obstruct the flow of water. Angle-valves, straight-way valves, and deflecting valves may be used.

Elbows, tees, and other fittings should be long-sweep water fittings. Ordinary short fittings, such as will do for steam, should not be used.

All waste pipes should discharge in open view, otherwise they may be leaking water constantly without it being known, and thus wasting fuel and perhaps leading to a dangerous condition of the apparatus.

When water is heated it expands, and there should be an expansion tank provided to receive the amount of such expansion, otherwise, when the water contracts by cooling, it might occur that the water column might be broken, that is, would not connect at the top. The expansion tank contains, so to speak, surplus water, so no matter whether it be cold or hot, there can be no breaking of the water column. It should be the highest point of the whole apparatus, and should connect with the highest point of the circulation.

The necessary dimensions of an expansion tank to contain the increase in volume of the water in the apparatus, arising from the heating thereof, can be ascertained by adding the volume in the boiler, the volume in the pipes, etc., and the volume in the radiators.

Divide the sum of these volumes by 20, and the quotient will give the necessary volume that should be in the expansion tank.

The volume of pipes can be taken from the table given by Baldwin, Thurston, and others.

It is not necessary, however, to find the separate volumes of boiler, pipes, distributors, and radiators. It will be sufficiently accurate for all practical purposes to divide the total radiation in square feet by 300 and the quotient will be the requisite volume of the tank in cubic feet.

Or, if the total square feet of radiation is multiplied by 5.76 the product will be the requisite volume of the expansion tank in cubic inches.

The connections from bottom of the expansion tank to apparatus differ in the different methods of heating and will be described hereafter.

The supply pipe to the expansion tank should be one inch, and should pass through the boiler room where it should connect with a hand-lift and force

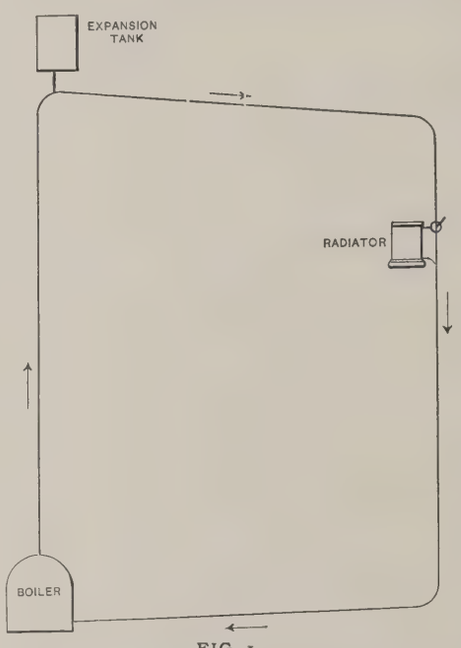


FIG. 1.

pump, usually about a two-inch brass barrel and seven-inch stroke, which must draw its supply from water works, cistern, or other source. It should then pass upward, and should enter near the top of the expansion tank.

There is another one-inch pipe to be taken from the expansion tank; an overflow pipe. This pipe should pass out from the expansion tank at the same level as the supply pipe and run to the boiler room, there to discharge the water into a trap, but always so that the discharge of the water can be seen. This pipe also acts as an air pipe. Bp the above arrangement it can be told if the apparatus is full of water; for by pumping a few moments, if the apparatus is full, the water will overflow and its discharge can be seen. If it does not thus overflow, then it needs pumping until it does.

Hot-water boilers need not differ from steam boilers, except that they should not have "steam space," that is, there should not be any large interior space in them. The smaller spaces should not be less than two inches in the narrowest way, and need not be much more, except at pipe entrances or exits, where they should be enlarged to accommodate all the water from or to the smaller spaces. A boiler of very large cubical contents is not desirable for hot-water heating, but it is desirable not to have the water passages narrow and rough and with square elbows. The less opportunities for friction there are the better.

If your boiler is not a "sectional one" (that is, one that can be taken into the building in small parts and there put together) see that you provide some way of getting it into the building and into its place.

It is desirable to put an altitude gauge on a hot-water boiler, but it is not indispensable.

It is also desirable to put a pop safety-valve on a hot-water boiler, though if the "open" method is used it is not indispensable. If the closed method is to be used, or if the means of changing an open method to the closed method is provided, then a pop safety-valve must be put on the boiler—a one-inch valve is usually sufficient.

One great advantage the hot-water system has is that, by keeping a small, low fire, the heat is graduated and the amount made suitable to mild weather. In fact, hot-water heating apparatus, to be perfectly run, should be governed by the firing at the boiler, keeping a low fire in mild weather, and a strong, lively fire in cold weather. If this were done, it would not be necessary to have any valves on the radiators; but it never is, and never will be done, at least in any thorough manner.

OVERHEAD METHOD.

The overhead method of hot-water heating, sometimes called the "Mills" system, from the name of the writer who described it, is to be preferred. In this overhead method the feed pipe is run from top of the boiler directly upward as nearly as is practicable to the attic. There branches are taken from this main feed pipe to points directly over the radiators in the stories below; thence, these branches descend, communicating with the radiators as they pass by means of two connections to each radiator; one from the branch pipe to the top of the radiator and another from the bottom of the radiator to the same branch pipe, as shown in Fig 4. The upper, or feed connection should have a valve upon it. The lower, or return connection should not have a valve.

By this arrangement when the radiator valve is open the water passes out from the branch pipe to the top of the radiator, thence passes through the radiator, and passes out through the lower or return connection to the branch pipe again; thence it passes downward and goes through any other radiator that may be on the lower story. In this manner it may pass through several radiators in different stories. Finally, it passes through into the basement and returns to the boiler.

Since the greater the difference of temperature between the hot-water

*Extract from an address delivered before the Engineering Societies of the University of Illinois, reprinted from the Inland Architect. Copyrighted, 1893, by the author.

column and the colder column, the greater the motive force is; therefore, the less heat the ascending column gives off, and the more the descending column, the more rapid is the circulation. It is therefore best to clothe the heated column with pipe covering and leave the colder column uncovered.

The water, after it leaves a radiator in an upper story, is of course at a less temperature than it was before it entered that radiator; therefore, the water enters the radiator in a lower story at a less temperature than it entered the upper radiator; usually, however, the difference does not exceed ten degrees. It is therefore necessary to increase the surface of the lower radiators to make up for the difference in the temperature of the water.

In the overhead method of hot-water heating, the whole apparatus is graded and arranged so that while the apparatus is being filled with water all the air therein can, and naturally does, ascend to the expansion tank and escapes therefrom through the overflow pipe. Consequently air cocks are not needed on the radiators.

The lowest point of the expansion tank should be connected with the highest point of circulation, that is, with the highest point of main feed in attic, or with top of distributer, by a one-inch pipe.

After reaching the attic the main feed-pipe may run horizontally around the attic to supply the branches, and similarly a return main may run around the basement.

It has, however, been found cheaper, more convenient, and as efficient to substitute for these horizontal mains a casting called a "distributer," shown in Figs. 2 and 3.

The main feed enters the bottom of this "distributer" and the branches pass out from the upper portions thereof, as shown in the drawing. The top of this distributer is connected with the bottom of the expansion tank so that air can escape into the tank and, through the overflow, from the tank.

The advantages of the overhead method are:

As the water which passes downward through an upper story radiator also may pass downward through the radiator in lower story, therefore both of the radiators are working together and one does not rob, but assists the other.

The main feed to attic is a comparatively large pipe, but it can be run in an out-of-the-way place, and be readily clothed, so as to retain the heat.

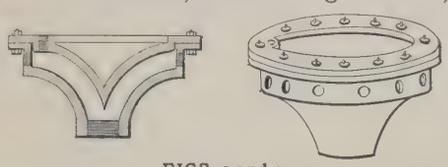
The descending pipes to radiators are relatively small and can and should be left uncovered. They pass through the rooms.

There need be no air cocks on the radiators, which cocks are apt to leak.

The valve that is upon the feed connection at top of the radiator may be an ordinary gate valve, but it is better to use what may be termed a deflecting valve. This is a valve which goes on a branch at the junction of the branch with the feed at the top of the radiator and is a flap valve. By turning the flap in one direction the water, if it moves at all, must pass into and through the radiator, whereas by turning the flap in the other direction the water must pass straight down the branch pipe without entering the radiator.

In order to retain the heat in the main feed-pipe and other feeding portions of the apparatus, the main feed pipe from the top of the boiler should be entirely covered with pipe covering. The whole of the portion of the apparatus that is in the attic should also be covered. If the boiler is not bricked in it should also be covered.

The branches, after leaving the attic,



FIGS. 2 and 3.

should not be covered. It is much the best that they should not be put in the walls, but, if the owner insists upon it, it may be done.

The more such pipes are exposed the more heat they give off, and therefore the greater will be the difference between their temperature and that of the feed-pipe, with a resulting increase of the efficiency of both; besides, any pipes at times are liable to leak, and if they are inclosed in the wall they are difficult to get at; also, the pipe itself acts as a radiator, and if you need any heat at all you need at least as much heat as the pipe will throw off.

The foregoing is a description of an "open" method of hot-water heating; that is, a method in which the water can expand, overflow, and escape, therefore no pressure can come upon the apparatus except the weight of the water.

This can be readily changed to a closed system by putting valves on the water supply and on the overflow pipes. The shutting of these valves would

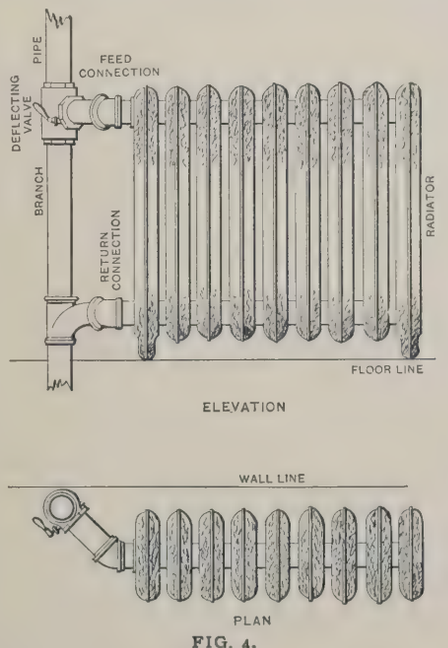


FIG. 4.

make a "closed" method. Leaving them open makes an "open" method.

In a closed method a pop safety valve should be put on the boiler. It is also well to make the expansion tank air tight and twice the volume of that needed for the open method, the supply and overflow pipes to enter the expansion tank at one-half of its height. The upper half of the expansion tank will then act as an air cushion.

It is intended, however, to use the "open" method exclusively, which means that the valve on water supply and overflow pipes will be left open. These valves are intended to give facility for testing the apparatus and are not for constant use. It is best before leaving the apparatus to screw the packing nuts up tight and to wire the handles of these valves so that they cannot be turned.

To ascertain the direct radiator surface, take the formula heretofore given:

$Q = R\ F\ J =$ requisite square feet of direct radiator surface in a room.

The value of R can be calculated by the rule already given. F is to be taken from Table II. This value

TABLE II.

Story.	Two-Story House.	Three-Story House.	Four-Story House.
First.....	1.2	1.25	1.30
Second.....	0.8	1.00	1.20
Third.....	... .	0.75	0.90
Fourth.. ..	....	.....	0.60

varies with the different stories. Thus in a two-story house and for the first-story rooms F is to be taken at 1.2, while for the second story rooms it is to be taken as 0.8. In a three-story house, for the first-story rooms $F = 1.25$, for the second-story room $F = 1$, and for the third-story rooms $F = 0.75$.

The value of the factor J will depend on the exposure of the room. Rooms which are exposed to prevailing cold winds (north and west sides) will usually require more than those on south and east sides, depending on surroundings. If the house is in a sheltered position little increase need be made. For north and west sides J is usually taken as 1.4, and on the south and east sides, $J = 1$. For bathrooms $J = 2$, for kitchens $J = 0.5$ to 0.7.

Direct radiators in entrance halls or near exterior doors should be largely increased; here J may be taken as 2 or instead, twenty to fifty feet may be added to the radiator. It is a good custom to increase the direct radiation wherever there are entrance doors or other opportunities for the admission of cold air.

The quantity of air necessary to ventilate the house can be determined by the rules already given under the heading of ventilation. The air should be introduced through stair halls and thence to the different rooms.

The air required for the ventilation of the building must be heated by indirect radiators, preferably by the direct-indirect radiators heretofore spoken of. As the hot water never gives off a high temperature, it is necessary that the quantity of surface in the indirect radiator should bear a large proportion to the air admitted. This is true whether the radiator is an ordinary indirect radiator hung to the basement ceiling, or the direct-indirect heretofore spoken of.

It is well to make the indirect radiation as much as one-fourth of the direct radiation in the building—indeed, it cannot be too much.

There should be at least two-thirds of a square foot of surface in the indirect radiator to each square inch of cross sectional area in the fresh-air duct, and it would be better if the indirect radiator could be from 50 to 100 per cent greater. It is usually troublesome to find room for the desired amount.

The Proper Standard for a Hot Water Radiator.

BY KNIGHT.

Having noticed the various criticisms which were made on the previous article of the above title, it suggests itself that the writers in each instance have not clearly grasped the idea which the article sought to set forth. Our friend "S. P. F." for instance, follows the idea partly, but abandons it in the conclusion of his criticism by stating that "it is necessary in order to secure a mild heat to increase the size of the radiating surface." Admitting the correctness of his statement, I would say that this idea of mild heat is one which, in my opinion, is often overdone. While this stands out among the first of the advantages to be obtained in water warming, the present attainments in steam heating go to show that the advantage that is claimed in this direction is not always borne out by facts, as any possessor of a properly proportioned steam apparatus can testify. The zeal and enthusiasm with which many fitters have pursued this method may be seen in many rooms warmed with a water apparatus, where the radiator comprises the larger part of the furnishings of the room and stands forth, a monument dedicated to this idea of mild heat.

I believe that a steam radiator properly proportioned is capable of giving as complete satisfaction, in the way of furnishing an agreeable temperature, as any water radiator, and there is no reason why, in any instance, a water radiator should be larger than that used for steam warming. The point to be closely observed in following out this idea is this, that after having proportioned the radiator (steam or water) on a steam basis, sufficient boiler power must be placed behind the radiation to enable one to command steam temperatures, or nearly such. Our friend "Elbow" evidently takes the same view of the situation when he states that his experience has demonstrated, "that water radiation at a temperature of from 190° to 200° should warm a room as well as if steam radiation was used." I believe he is right, although his reasons for this fact are not correct.

There seem to be, in the minds of the several critics, mysterious obstacles with regard to the internal working of the radiators, which prevent their ready adoption of the idea of the single standard. These obstacles take a definite form as, "velocity of the circulation" and "the amount of water contained by the radiator." For instance: Thermo states that "the relative difference in temperature of steam and hot water is so great, and the velocity of their circulation so unequal, that one cannot expect that a proportionate increase of the one will bring about the same proportionate change in the amount of heat units discharged." I do not understand what he means by "the relative difference in temperature of steam and hot water." Sometimes there is a difference and sometimes there is not, the difference depending largely upon whether the temperature is the same. As to the velocity of the circulation, so long as the temperature is maintained, it cannot matter materially whether this circulation is rapid or slow. In the matter of "heat units discharged," I believe it to be dependent merely upon the difference in temperature between the radiating and receiving surfaces and bodies, and it is in no wise dependent upon what we may choose as a circulating medium for the distribution of heat. The quantity of water which any radiator may hold, plays a very small part in increasing or decreasing the efficiency of that radiator. This question of capacity is one which seems to be specially attractive to the trade, and there have been many arguments advanced both pro and con, but so far as the theory of the transmission of heat from the surface of a radiator is concerned, we do not see how this can enter as a factor in determining the size.

"T. C. J." gives a very creditable list of the conditions which must be considered in order to properly proportion any radiator, but he is evidently loath to depart from the ancient and time honored usage of considering water materially different from steam when employed as a circulating medium in a warming apparatus.

In Elbow's article, I note that he agrees in the main with what was expressed in the previous paper, but, like Thermo, he stumbles over the problem of the amount of water which should be held by a radiator to secure the highest efficiency. He remarks, and rightly, that there has never been anything yet produced to equal in effective radiating surface that of one, inch pipe. In continuation, he shows that, in his own mind, the reason for this efficiency is due, in a large measure, to the small amount of water which the pipe holds in comparison with the amount of water held by the ordinary radiator. To me, this is an entirely new explanation. I have always been led to believe this efficiency due to the arrangement of the pipe surface rather than to any relation between the surface and its internal capacity. The efficiency of a wall coil has always been very high because its surface is advantageously placed for the conveyance of heat both by radiation and convection.

Granting that the efficiency of a wall coil is the highest of any form of direct radiation, we note that if the number of coils be doubled or increased as in a box coil, a marked decrease in the efficiency follows, this decrease being in direct proportion to the number of coils thus placed together. The efficiency of a single row radiator or coil is high. Doubling or increasing the number of rows produces a like decrease in the efficiency, and this is due to the fact that in increasing the number of rows a large part of the surface is shut in and deprived of the opportunity of radiating its heat. I believe it is not generally known how large a per cent of the heat given off by any radiator is given off entirely by radiation, the popular idea being that the radiator does all or nearly all of its work by convection or contact with the air.

About one-third of all the heat given off by a direct radiator is given off by radiation. This being so, it can be readily seen how important a part is played in the efficiency of any radiator by the construction and disposition of its surface, and how important it is that all the surface possible should be so arranged as to permit the freest radiation of heat. This same fact may be demonstrated in another way. At the time of the existence of the Radiator Association of the United States, about two years ago, there were certain tests made to inquire into the merits of a question with regard to the relative efficiency of the radiators of the Association makes and the so-called flue radiators. These flue radiators were of a construction specially adapted to the distribution of heat through convection, and by their construction paid little or no attention to the arrangement of their surface for securing favorable opportunity for radiation. In these tests, it was found that, foot for foot of rated surface, the flue radiator fell behind the Association makes about one-third. To render the argument substantial in dollars and cents, it was admitted that it would be placing the radiators on an equal basis if the flue radiators were sold at one-third less per foot than the price which it was agreed should be asked for the Association surfaces.

One-inch pipe is good heating surface, but its efficiency is due to the arrangement of its surface, and in no wise dependent upon its capacity.

The idea of a small amount of water in an apparatus is one which has been considerably in favor and has been more or less productive of discussion.

The writer, in conversation with a fitter, recently broached this subject. The fitter preferred the apparatus with the least water in it because, to quote his own language, "You can light the fire in the boiler and shoot the water right up through the whole business," a method of procedure which evidently met every requirement of his desire for a quick circulation. There is no question but that he was right in one respect. With a small amount of water in an apparatus, one can secure a quick distribution when starting. It must be borne in mind, however, that the energy or power for the circulation of the water in the apparatus is resident in the return pipes, and the rapidity with which the water circulates is in proportion to the cooling which takes place in the radiation. If one has comparatively little water in an apparatus, one can, of course, heat it quicker than a large amount. At the same time it cools quicker. With a larger amount of water there is much more available heat. Having the system once working, the demands which are

made upon it are exactly the same, whether it contains a large or a small amount.

The problem in warming any house is to maintain the temperature, and in order to maintain the temperature it is necessary to put into the apparatus just as many units of heat as have been lost to the outside air through walls and windows. There will be as great a waste of heat in a house warmed by an apparatus with a small amount of water as with one containing a greater amount. The larger amount of water, having of necessity the most available heat, is capable of maintaining a steadier temperature, and is, therefore, the most desirable.

The writer would not be understood as insisting too forcibly that the capacity of the one-inch pipe was not the right proportion between surface and contents. At the same time he believes that this question of capacity is one which is accorded more importance than is its due, and that in the use of radiation in an apparatus of the size most often met with in the average house work, it is a point which for most practical purposes can be disregarded.

Again, quoting from Elbow's article, he says, "The radiator holding the lesser body of water can be raised to a higher degree of temperature in a shorter period and more easily maintained." I agree that the smaller body of water could be raised to a certain degree of temperature in less time than the larger body under the same conditions, but that it could be maintained more easily is a statement the reasons for which are not clearly apparent and I think would not be borne out in practice. He further states that this can be done with less fuel consumption. This seems reasonable, inasmuch as it is not doing as much work. He continues, "and have a more rapid circulation than the larger body." Here again comes the question. It is a choice between a small body of water with its smaller amount of available heat and consequent liability to unevenness of temperature and the larger body with the increased heat capacity and consequent increased stability. I repeat that, under the same conditions, if the temperatures are maintained the same amount of heat is lost to the system, whether there is a large or a small body of water contained.

The smaller body of water is of course the most affected by the loss of a given amount of heat. This demonstrates the increased stability in temperature of the larger water bulk, which, being one of the advantages of a water system, cannot prove much of an argument in favor of a smaller bulk.

I must agree with Elbow in his statement that many heating jobs fail on account of lack of the temperature of water in the radiating surface, and I will go a step farther and say that in place of "temperature of water" he could have used the word "boiler," for they are synonymous in the present instance, and by "boiler" I would, for the present, be understood as meaning capacity for burning fuel.

Elbow's experience has shown him that he can heat a room as well with water at 200° as with steam at 212° in the same size radiator. As I have before stated, I agree with him, and it is because of the greater stability of the water radiation and the increased evenness, as compared with steam, with which it maintains its temperature, which gives it this added efficiency.

Elbow's argument against the larger water bulk, as necessitating the placing of weight in the building, is certainly unique and original, and carries the question a step farther than it has, to the writer's knowledge, yet been advanced, but it is too bad to force this added responsibility on the subject. Taking an average radiator of 50 or 60 feet, with ten or twelve sections, holding about one gallon each, we have a water weight of about 80 or 100 pounds, which is one that we believe can be safely introduced into the several rooms of the average house without danger. Of course if we insist in our practice upon the use of large radiators, "monuments of mild temperature," it will be advisable, by all means,to strengthen the factor of safety to be employed in our building calculations. I would again state that I believe this question of water bulk to be one upon which undue stress is laid, and for this reason I can hardly see fit to concur with Elbow in his advice to the fitter to calculate the amount of water to be heated as well as radiation to be warmed. On further thought, however, I might endorse this advice to a certain extent, since, beside the added advantage which would accrue to the fitter from this extra practice in mathematics, he could, in case of his becoming later on a convert to the smaller water bulk, use the results secured from his calculations to verify the size of the expansion tank.

My advice to the fitter would be to think as little as possible regarding the inside workings of the apparatus. If there is anything wrong with regard to the circulation it will make itself evident at a very early date. Keep the boiler well in mind and be sure to get one of sufficient size. If this last point is followed closely, when it comes to a device of radiators, the fitter can afford to disregard a certain per cent of the over-rating of surface by the manufacturer and any exaggerated capacity which may happen to be allotted to the style of radiator which is the most convenient for him to handle.

Church Heating by Hot Water Apparatus.

The heating of churches to a comfortable temperature during the winter months in this climate is a question which requires and has received considerable thought. The apparatus that will give the best results, combining safety, noiselessness, uniform temperature, and greatest economy with least attention, is always the desired system. It is always aimed at, but not always attained.

In Catholic churches, which are occupied during the entire week, it is more necessary that the heating system should combine all these advantages, as very frequently the persons having the heating apparatus under their care have other duties to perform that demand their attention, making it impossible to give their entire time to the heating apparatus, and still it is very necessary that a building of this class should at all times be heated.

The church of the Most Holy Redeemer, in East Third street, which is one of the largest church buildings in New York city, was formerly heated by steam ; and while there was ample radiating surface, which when heated furnished ample heat for the building, it was not always noiseless in operation, and required constant attention and a large consumption of fuel to obtain good results ; and when neglected for any length of time, as was often the case, the building cooled down to or below 50 degrees F. While the question of improving the apparatus was given considerable attention, the general arrangement of the building prevented any improvements to the steam heating apparatus.

After consultation with Mr. W M. Mackay, the well-known expert in hot water and steam heating, it was decided to remove the steam apparatus and replace it with a hot water heating system. Wishing to keep the aisles free from radiators, it was decided to place the radiating surface in pipes, arranged below each seat, giving the most uniform distribution of heat with the least objectionable features. The contract was awarded to Albert A. Cryer & Co., heating engineers, of 85 Centre street, New York, who make a specialty of hot water heating.

It was decided to retain the boiler which was used for heating the building by steam, and a 6-inch flow and return pipe was connected to it and carried about 100 feet, rising into the church at the front of the pews, where it was divided into two 4 inch flow and return mains. Each of these was carried along the partitions between the pews below the seats, the flow pipe being carried above the return, and they were connected by means of two coils of two-inch pipe at the entrance of the church. From the side of this flow and return pipe a loop of $1\frac{1}{4}$-inch pipe 10 feet long is carried under each seat. There are about 300 feet of 2-inch pipe, 2,000 feet of $1\frac{1}{4}$-inch pipe, and about 400 feet of 4-inch pipe used for radiation ; and the general arrangement is such that no useful space is occupied by them, and they are scarcely perceptible, while they give a uniform distribution of heat.

The result obtained by the operation of the system since its completion has fully warranted the expense of the change, and does credit to the contractors, who have placed the work in a first-class manner, with careful workmen, and without interfering with the use of the building during the erection of the apparatus.

The system is noiseless in operation, absolutely safe under all conditions, and can be left without attention longer than any other system ; and with about half the coal necessary with the other system, heats the building comfortably and uniformly in the coldest weather.

Furnace Work.—I.

James N. Harding

This is a subject to which justice cannot be done by a consideration of its merely mechanical details. Such a treatise would doubtless be of service to mechanics, but it would lack comprehensiveness and fall short of the writer's interest.

To be successful in this line of work a knowledge of its science will prove indispensable, and it is proposed to treat the subject under the head of applied science as well as mechanics.

Again, "to be successful" is a phrase requiring definition: to put up one furnace and its accessories in a manner to appear well and perform its functions in a perfect manner is a measure of success, but to multiply the transaction many times, with profit, and build up a business upon sound mechanical, scientific, and commercial methods, is the true measure of success in furnace work.

A knowledge of the science and mechanics of furnace work will determine what mechanical features can and what cannot be introduced, what must and what need not be supplied, and will guide the commercial instinct in planning a piece of work at the minimum cost consistent with assured success in heating.

The commercial aspect of a prospective heating contract is usually the first to arrest the attention. Sometimes it bears the stamp of extreme cheapness, and calls for such close figuring that an opportunity is lost to science; again, it is a case where appreciation of best efforts in the mechanical and scientific lines, and ample means to remunerate them, are not wanting.

Good judgment at this point is necessary to decide upon such a line of action as neither to cast "pearls before swine," nor yet to underestimate the intelligence or appreciative qualities of a customer.

It need hardly be urged in this enlightened epoch that the practice of refusing to give suggestions or information to an architect or owner of a building until the heating contract shall have been secured is a constructive and, in most cases, not an operative inducement. Such refusal, intended as it is to give the impression that the furnace man is sole possessor of some occult formula or scheme which the owner cannot afford to be without, whatever the cost, usually engenders a suspicion that the furnace man is either a humbug or a novice.

On the other hand, the plain unvarnished truth will, with customers who have predilections created by miscellaneous reading or consultation with misinformed people, often fail to convince, while an admixture of humbug will succeed.

These matters constitute the politics of furnace work. A good furnace man may be a poor advocate, and *vice versa*. Speaking literally, it is not pure science.

A proposed heating plant about which there is a doubt that it can develop its own merits should be refused, even in the face of visible profit. The furnace man should have the courage of his convictions and stand for true principles, and his reputation. The best heating contracts are usually let to men of reputation.

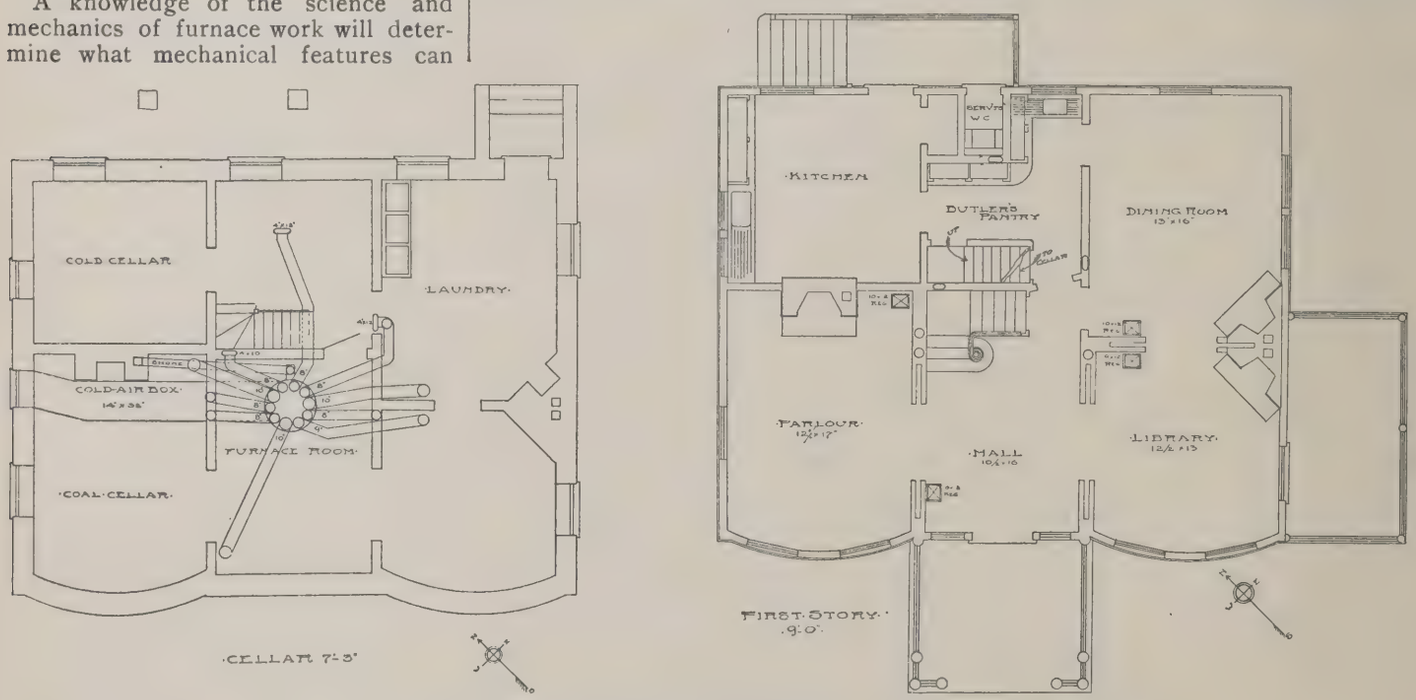
The most intricate and important jobs are planned with, and in harmony with, the other features of a building, and are installed under the eye of the architect. Such of them as work out best and give the most complete satisfaction are usually the product of the joint study of the furnace man and the architect, and are "cut and dried" before an excavation is made for the cellar.

A knowledge of construction as well as design is necessary to justly qualify an architect, and the co-operation of such a one cannot fail to assist and benefit the furnace man. There are professionals proficient in the art of designing, but palpably deficient in knowledge of construction, who cannot assist the furnace man, but rather embarrass him with suggestions of impossible construction and impracticable arrangement conceived by themselves or by their clients and adopted by them. In dealing with this class the tact and address of the furnace man are necessary to avoid a failure.

There may be, and doubtless are, in some instances, grounds for prejudice of the furnace man against the architect, but it should be observed that the architect obtains much of his data and many theories from the very class who complain. His position is one of difficult responsibility (if the term be allowed), and is such that a really intelligent and expert furnace man can be of valuable service to him and *vice versa*.

The applicability of the foregoing general remarks is largely a matter of environment, each furnace man's experience developing the tendencies of his locality.

In proceeding to a more direct treatment of the subject, attention is directed to the accompanying plans of a small country house, the arrangement of the heating apparatus being shown thereon.



Plan of Cellar and First Story, Showing Location of Furnace, Hot-Air Pipes, and Registers.

It will be assumed in this case that the conditions are about as follows: viz., it is required to heat all rooms in first and second stories in which registers are shown to 70 degrees and the third story rooms to 60 degrees in zero weather. The arrangement and position of registers is left to the furnace man; the price must be low, and bids will be received in competition.

It is apparent at once that owing to the compactness of the plan the problem of heating is not difficult; the kitchen, too, not requiring heat from the furnace, is at the cold corner. The first story rooms are in almost every case the most difficult to heat; such will be the case here. That these rooms shall have a nearly equal advantage, it is necessary that the hot air pipes leading to them shall be nearly of equal length,

favoring the cold side. These reflections point to a location of the furnace near the center of the house or under the hall. The position of the cellar stairs is such that the furnace must set between them and the front of the house, hence the selection is for a position nearly under the main staircase.

Thus far the furnace has been approximately located without considering the second story rooms. Longer lateral pipes to these rooms are admissible, but before fully determining upon the location of the furnace, they should be considered in detail.

First, the vertical pipes leading to the second and third stories should all terminate in the cellar as near the furnace as possible. Where avoidable, one pipe should not be employed for heating two rooms unless they are in the same story and then with caution. Round pipes carry heat better and cost less to make than other forms. It pleases a customer to find hot air pipes conspicuous by their absence from his cold or wine cellar. The cellar in this case is 7 feet 3 inches high, and pipes cannot pass over door heads.

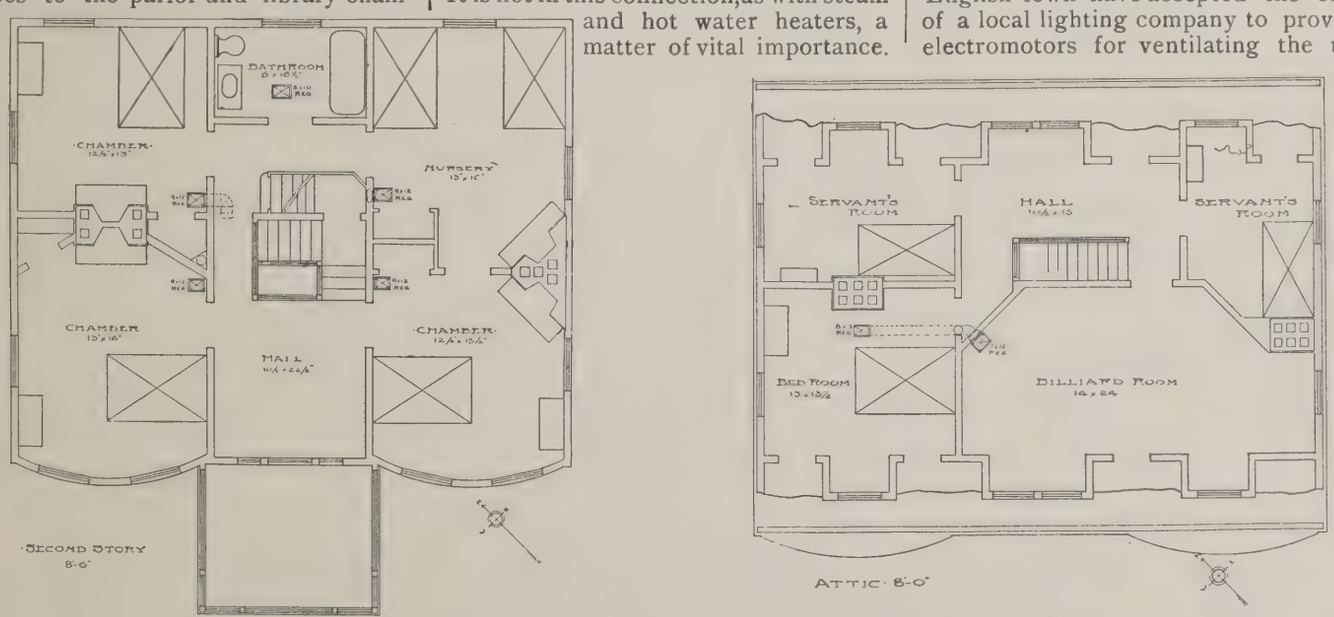
The sliding door partitions in the first story admit of carrying round pipes to the parlor and library chambers in the second story, which are connected to deep register boxes set in the floors by turning an elbow out between the floor joists.

A continuous round pipe also is carried to the third story by making a slight offset into the closet between the second tier floor joists. These three pipes are made double throughout, it being cheaper to do so and a better job than to inclose single pipes with any form of iron lathing and steel lining. (Asbestos paper wrapped about single pipes is sometimes used, with a saving of expense, but is not generally acceptable.)

The registers are placed in the floors of these rooms to admit of more direct and less expensive connections. Placing them in the partitions would necessitate oval or square (flat) pipes with "reducers" from round to flat and run up the cost, while the present object is to heat to 70 degrees and to do it cheaply.

The pipes for the kitchen chamber, nursery, and bath room need to be made flat and placed in 4-inch shed partitions; the register in the bath room being in the floor more from necessity, and the other as much for the sake of uniformity as anything. The pipe for the kitchen chamber is placed in the cross partition through the first story so that the lateral pipe from the furnace need neither cross the stairway nor enter the cold cellar in a circuitous manner, the turn to the register at the top of the vertical pipe being easily provided for between the second tier floor joists by framing where there are only unimportant short joists. The lateral pipe to the bath room can be run by close calculation under the second tread of the cellar stairs without cutting the stair string and be kept 8 inches from the door jamb. The lateral pipe to the nursery is run somewhat "crooked" from actual necessity.

The exact position of the furnace to best meet foregoing conditions and provide for the best arrangement of pipes upon it is now fully calculated and the furnace is located. It is to be noted here that proximity of the smoke flue has not been taken into consideration. It is not in this connection, as with steam and hot water heaters, a matter of vital importance.



Plans of Second Story and Attic, Showing the Location of Registers and Hot-Air Pipes.

The butler's pantry is not required to be heated. The servant's water closet is not provided with a register, as, owing to its small size, the close confinement of air within it and its only entrance facing a probable wind pressure from the north it is very nearly certain that warm air would not flow into it. On the contrary if the door were left open and the wind favorable a hot air pipe connecting the furnace with it might ventilate this room through the furnace to the destruction of atmospheric purity in other parts of the house, a result frequently accomplished in scientific (?) school house ventilation.

The furnaceman can safely guarantee the heating of this room by a method which will be considered at a future time in connection with a more elaborate scheme for the whole house. The other general features of these plans and some of the details of the work will be considered in the next article.

Drainage and Ventilation of Stables.

The sanitary condition of stables is a matter which has not received anything approaching the attention which it deserves, says the *National Building Register*. The effects of an intelligent consideration of this question, followed by the necessary action for bringing about improvement, have been strikingly instanced by Edward Tidman, of London, in a paper on "Sanitary Ventilation" recently read by him before the Surveyors' Institute of that city. The case quoted is one of a cavalry barracks, where the death rate of the horses was 180 to 197 per 1,000 per annum. The stables were rebuilt on designs in which provision was made for efficient drainage and ventilation, and during the following ten years the death rate fell to 28.50 per 1,000. Mr. Tidman says that seventy-five per cent of town stables in England are in such an unsanitary state as to be dangerous to man and animals, and to this cause is attributed the prevalence of glanders, farcy, and other diseases among horses.

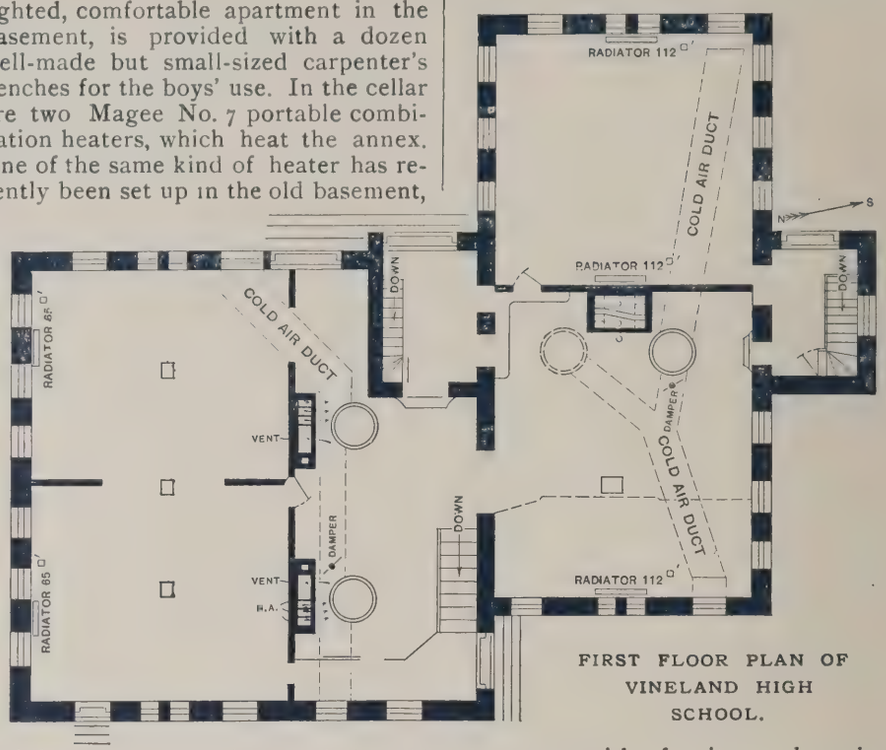
THE municipal authorities of an English town have accepted the offer of a local lighting company to provide electromotors for ventilating the uptake columns of sewers, says the *National Building Register*. The motors are to be continuously supplied with current for three months for $25 each, tests being taken in the mean time of the amount of foul air extracted from the sewer. The introduction of electromotors for this purpose is by no means the first occasion on which mechanical power has been employed for removing dangerous gases. Large blowers and fans have been successfully used for carrying a supply of fresh air through the workings at mines and collieries. Formerly the ventilation was effected by hot air currents, a furnace being kept up in the up-take for the purpose of heating the out-going air and thus creating a draft. The superiority of electrical ventilation, however, has been so conclusively demonstrated for almost all ordinary conditions that it is being very largely used, and in an indefinite number of ways.

Heating of the Vineland High School.

The Vineland, N. J., High School was erected in 1874, at a cost of about $30,000. It is a solid brick building, three stories in height, with Mansard roof of tin and slate. It originally contained six rooms, each about 30 by 33 feet, and 12 feet in the clear. The building was originally heated by hot air furnaces, which failed to give satisfaction in extremely cold weather.

In 1892 an annex was built, 54 by 56 feet in size, and with spacious halls on each of its three floors. On the first floor are two school rooms; on the second two school rooms, besides the teachers' and the district clerk's rooms; third, two school rooms, teachers' and principal's rooms. The two school rooms on each floor, 25 by 30 feet and 12 feet in the clear, are separated from each other by sliding doors, enabling both to be thrown into one room during opening services in the morning.

Heat is supplied to the rooms by means of registers in the walls several feet from the floor, and these are reinforced by radiators at the opposite end of the apartment. The latter are fed by hot water, which, starting at the furnaces in the cellar, circulates through all the rooms, throwing off heat wherever the pipes are located. The vitiated air of the rooms passes out through a ventilator in the wall on a level with the floor, and directly under the registers. The manual training room, a well lighted, comfortable apartment in the basement, is provided with a dozen well-made but small-sized carpenter's benches for the boys' use. In the cellar are two Magee No. 7 portable combination heaters, which heat the annex. One of the same kind of heater has recently been set up in the old basement, and does the work of two of the old hot air furnaces. Another furnace, shown by the dotted circles will be put up this year.



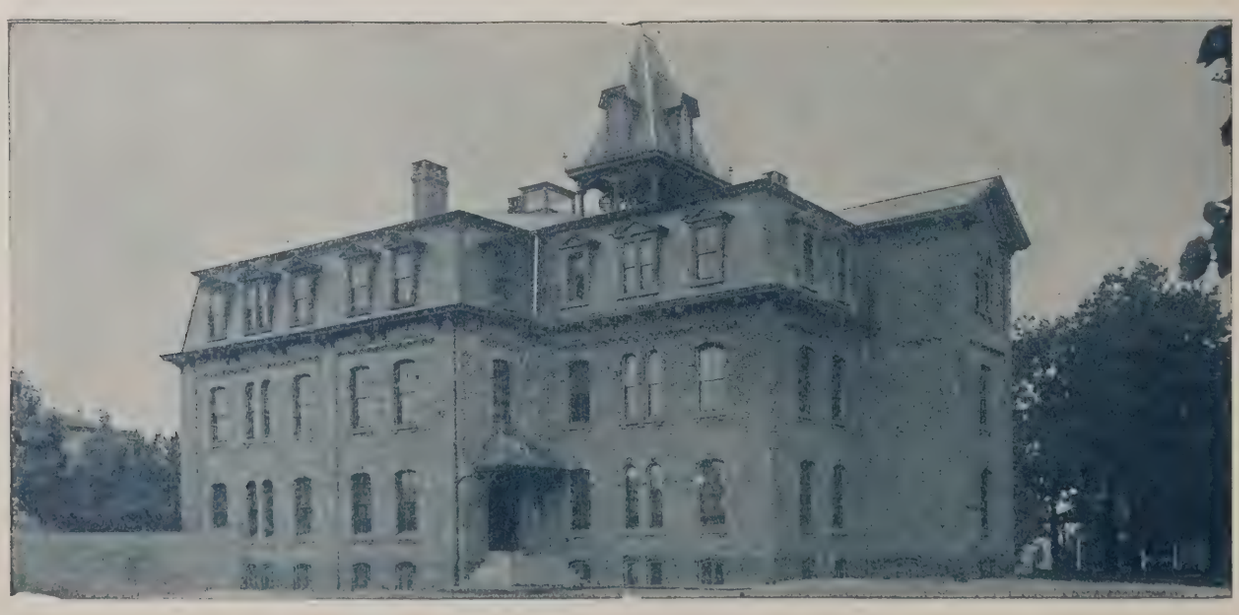
FIRST FLOOR PLAN OF VINELAND HIGH SCHOOL.

ANEMOMETER TEST OF THE VINELAND HIGH SCHOOL.

No. of room	3	7	11	4	8	12
Av. velocity in feet	157⅛	155	476⅝	106⅛	230⅜	374⅝
Cu. ft. per minute	410	331	926	216⅔	493⅜	728
Cu. ft. per hour	24,600	19,875	55,560	12,978⅛	29,593	43,680
Velocity of wind per hour in miles	23	23	23	23	23	23
Temp. inside	62°	64°	60°	68°	67°	65°
Temp. outside	12°	12°	12°	12°	12°	12°
Temp. in cellar	67°	67°	67°	67°	67°	67°
Size of room	25×30×12	25×30×13	24×26×12	25×30×12	25×30×13	24×26×12
Cu. ft. in room	9,000	9,750	7,488	9,000	9,750	7,488
No. of days room was heated	204	204	204	204	204	204
Tons of coal per room	5	5	5	5	5	5
Lbs. coal per day	49	49	49	49	49	49
Cu. ft. heated by lb. coal	12,300	9,937½	27,700	6,357⅞	14,494	21,598⅛
No. of pupils in room	42	40	43	42	40	31
Cu. ft. of air per pupil per hour	586	472	1,294	309½	739⅜	1,409⅞
Total change of air in minutes	21.95+	29.82+	8.08+	43.14+	19.77+	10.28+
Lbs. coal per day for each pupil	1⅛	1⅛	1⅛	1⅛	1⅛	1⅛

The school accommodates about 500 pupils, 45 to each room. Thirteen teachers are employed, including the supervising principal. The building is lighted by gas, and has city water on each floor. The entire cost of the structure, with furniture, has been about $45,000.

The heating apparatus was installed by Lewis W. Gould, Vineyard, N. J., who made an anemometer test, with the results given in the accompanying table. The test was made early in the morning before anything had been done to the fire, which had been banked up the night before. At the time of the test the wind was blowing in a northwesterly direction at the rate of 23 miles an hour. Under these conditions the results obtained would seem to be remarkable.



HIGH SCHOOL BUILDING AT VINELAND, N. J.

Steam and Hot Water Fitters' Guide.

Q. 116—In direct-indirect heating how is the radiation arranged?

A.—One method is shown in Fig. 1, where, as will be seen, a flue in the wall conveys the cold fresh air from the outside of the building to the base of the radiator, up through which it passes before entering the room. Another direct-indirect radiator, which

differs somewhat from that shown in Fig. 1, is illustrated in Fig. 2. Within the outer base of this radiator is a cold air box, as shown in Fig. 3, which is placed over an opening in the floor, communicating with the outer air. As

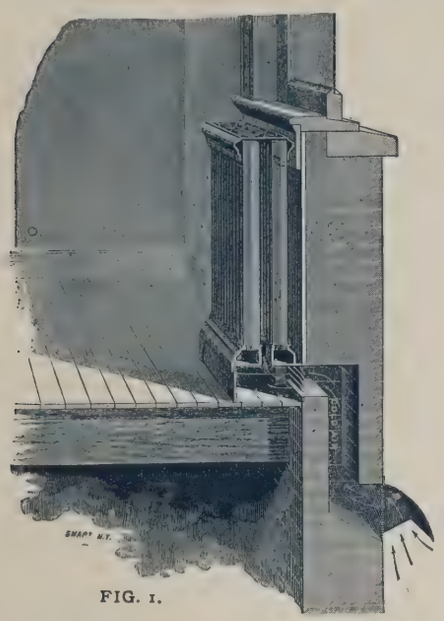


FIG. 1.

shown, this cold air box has a closed top, and ends with sloping open sides. At the base of the V formed by these sides and the sides of the base are pivoted two dampers (Fig. 3), so arranged that simultaneously both may be moved so as to cover the openings in the inner box, and thus exclude all outside air; or they may be moved so as to cover the open work of the sides of the base, and thus exclude all the air from the room; or they may be set in any position and locked, so as to admit a certain amount from the room, and the balance needed to circulate through the radiator, from the outside, or *vice versa*. The mechanism for working these dampers is operated by a T handle on the end of the base. Connected with this is a hand wheel that locks the dampers in any desired position. The air after being admitted to the base is drawn upward into the spaces or flues between the radiator sections, the sides of which are provided with vertical flanges which reach out to and nearly come in contact with corresponding flanges on the adjoining sections, thus forming a main flue with a large opening at the bottom, so as to freely admit a maximum quantity of air. On the face of the sections are cast a series of short, oblique flanges, which, by reaching out and meeting those on the next section, form a number of short, oblique flues, the lower ends of which being a sufficient distance from the vertical side flanges, so as to form a main flue on each side, to deliver the air from the base into these flues. The upper ends gradually diminish in length as they near the top, and form a gradually enlarging hot-air flue in the center for the discharge of the air as it is heated within the short flues. The closed vertical flanges at the sides of the sections extend upward only a sufficient distance to allow the currents of air to extract from the heated walls and flanges all the heat it is capable of receiving. Above this, fresh air is drawn in through the ornamental open work of the sides. The open-work side flanges are detachable.

Q. **117**—What is the rule for proportioning radiating surface for direct steam radiation?

A.—The following rules are used by various authorities. The name of the author is given at the end of each rule.

"The ordinary rule of thumb way of the average pipe fitter is to multiply the length by the breadth of a room, and the result by the height, then cut off two figures from the right hand side, and call the remainder square feet of heating surface, with an addition of from 15 to 30 per cent for exposed or corner rooms. This is for high pressure steam, but for low pressure—2 to 5 pounds—as much as 100 per cent is sometimes added, according to the size of the rooms and the purpose they are intended for. The cubical contents of a room occupy only an inferior place when estimating for large rooms and halls, and little or no place in figuring for small or office rooms or residences, which are heated from day to day throughout the winter. Divide the difference in temperature between that at which the room is to be kept and the coldest outside atmosphere by the difference between the temperature of the radiating surface and that at which you wish to keep the room, and the quotient will be the number of square feet of radiating surface to each square foot of glass, or its equivalent in wall surface."—*William J. Baldwin.*

"Where the temperature in the room is to be maintained at 70 degrees, with

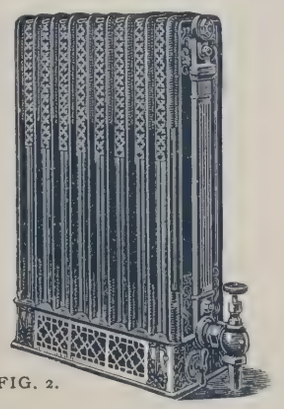


FIG. 2.

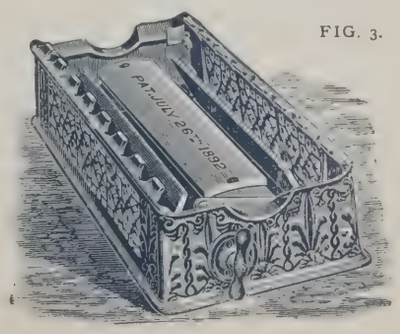
an outside temperature of 10 degrees, one square foot of direct radiating surface to two square feet of glass surface or its equivalent in wall surface is required. Where the exposed surface is small in proportion to the capacity or cubical contents of a room—as one square foot of exposed surface to 75 or 100 cubic feet—a larger amount of radiating surface should be used, and in such rooms a proportion of one square foot of radiating surface to 60 or 80 cubic feet of space is required."—*Anson W. Burchard.*

"Multiply the number of square feet of glass and its equivalent in exposed wall surface by .7 and the product will be the number of square feet of radiating surface required; or, multiply the number of lineal feet of exposed wall surface by .5 for apartments up to 10 feet high; for every addition of 2 feet or less to this height add 1 or a fraction thereof to the multiplier (.5) and divide the product by 3; the quotient will be the number of square feet of radiator surface required. In apartments with one wall exposed, or in which exposed walls are equal to less than 0.4 of the surrounding walls add 0.2 of the exposed wall to the lineal feet and proceed according to the above rule. For entrance halls of rectangular form, multiply the width of the exposed end by the height of the hall and the product thus obtained by 0.7, and the result will be the necessary radiating surface in square feet."—*John J. Hogan.*

"Multiply 125 by the difference between the temperature at which the room is to be maintained and the temperature of the outside air, and divide this product by the difference between the temperature of the pipes of the radiating surface and the temperature of the room; the quotient thus obtained when multiplied by the number of cubic feet of air to be warmed per minute, and this product divided by 190, will give the number of square feet of radiating surface at the temperature stated. Then, as the difference in the temperature of the radiating surfaces above the temperature of the room is to the difference in the temperature of the radiating surface at the temperature above stated above the temperature of the room, so is the product of the square feet of the preceding rule to the number of square feet of radiation required."—*Charles Hood.*

"Multiply the loss in heat units per square foot of exposed wall surface per hour for a difference of one degree between the external and internal air by the difference in temperature between that of the outside air and that in the room and by the number of square feet of exposed wall surface, and the product will be the loss in heat units through the exposed wall. Find the loss in heat units through glass in the same way. Multiply the cubic feet of space of the room by 1 for one change of air per hour by the number of degrees difference between the external air and the temperature of the air in the room by the units of heat necessary to warm one pound of air one degree by the weight of one cubic foot of air at the external temperature, and the product is the number of heat units which must be expended to warm the air in the room to the desired temperature. Add the three preceding products and the result is the total loss in heat units per hour, and divide this result by the heat units emitted per square foot of radiating

FIG. 3.

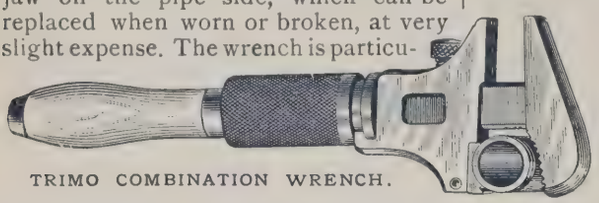


surface, and the quotient will be the number of square feet of radiating surface required."—*John Hopson, Jr.*

NEW SPECIALTIES.

TRIMO COMBINATION WRENCH.

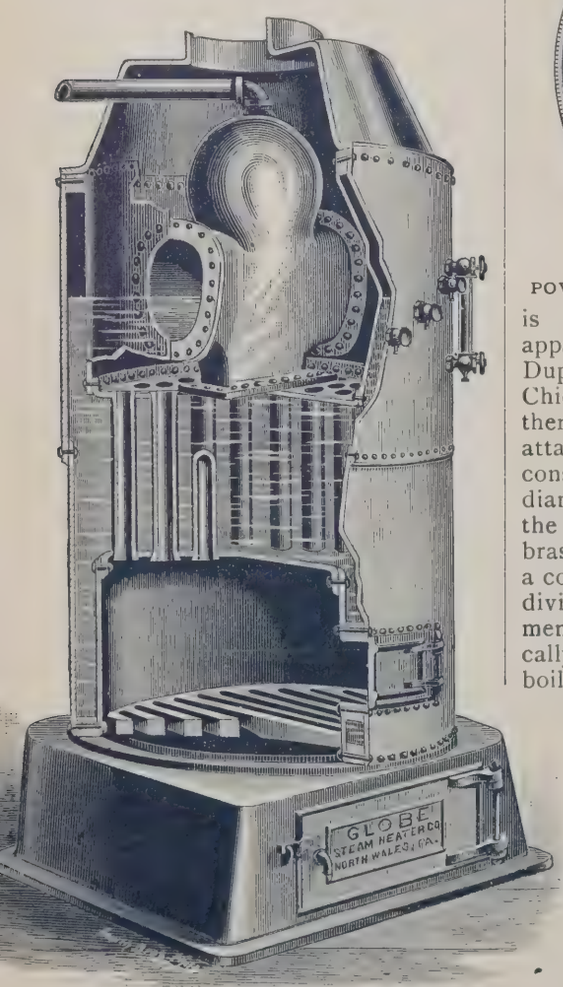
As will be seen by reference to the cut, a small knurled set-screw under the jaw takes up the loose motion when it is desired to use the wrench on square or hexagon nuts. There is an insert jaw on the pipe side, which can be replaced when worn or broken, at very slight expense. The wrench is particularly designed for the use of machinists and engineers, who wish a rapid adjustment and great strength. Its construction is such that it will take firm hold on the pipe and release the hold instantly without slipping or crushing the pipe. It performs the office of a nut wrench equally well, combining simplicity and strength with quickness of adjustment. A long sleeve nut allows of a firm grasp in tightening the wrench. It is manufactured by the Trimont Mfg. Co., Roxbury, Mass., in three sizes, 10, 12, and 15 inch, having a capacity from ⅛ to 2 inch pipe.



TRIMO COMBINATION WRENCH.

THE KREIBEL VERTICAL BOILER.

The cut presented herewith is a sectional view of Kreibel's vertical steam boiler on square base with improved hood. As shown, the top tube sheet is dropped down below the water line in the boiler, thus placing the tubes entirely under water, obviating their getting loose in the head and leaking. The engraving shows steam chamber riveted on the top tube head, which is also riveted to the sides of the steam space of the boiler as shown, giving free circulation for the water and steam to and from this chamber, which is surrounded by the flames and heat of the fire which rise through the tubes from the furnace below, and superheat the steam. The steam pipe is attached to the top of the chamber at the point farthest off from the water and in the center of the boiler. The sheet which supports the top tube sheet or head is parallel with outside or shell of the boiler. The tubes are of sufficient number to secure a large heating surface; the arrangement of the tubes, the water space around the furnace, the steam space around the combustion chamber at the top of the boiler, and the steam chamber in the combustion chamber, are made with a view of obtaining perfect circulation of the heated water. The Globe Steam Heater Co., North Wales, Pa., are the manufacturers.



KREIBEL VERTICAL BOILER.

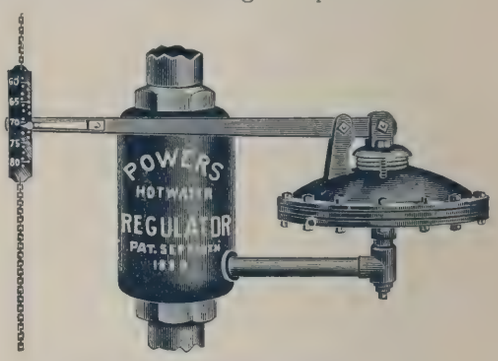
POWERS DUPLEX REGULATOR.

The hot water damper regulator shown in the accompanying illustrations



POWERS DUPLEX REGULATOR.—FIG. 1.

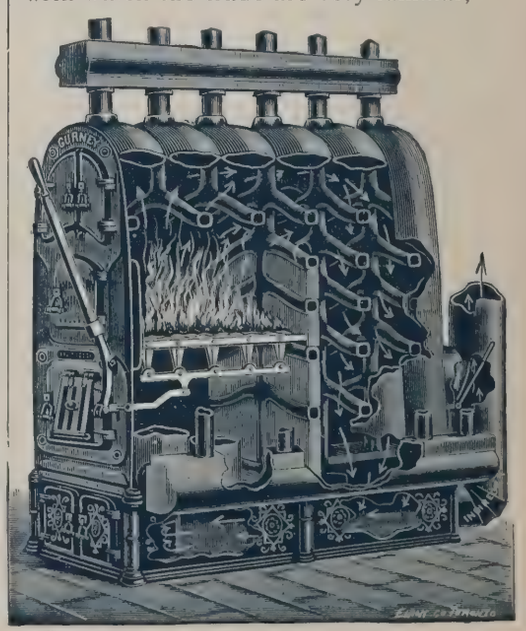
is a novel temperature controlling apparatus, manufactured by the Powers Duplex Regulator Co., 90 Illinois street, Chicago, Ill. Fig. 1 shows the vapor thermostat with a dial thermometer attached to its face. The thermostat consists of a disk twelve inches in diameter and 1¼ inches in thickness at the center. It is made of heavy sheet brass of antique finish, and has inside a corrugated metallic diaphragm which divides it into two separate compartments. In one compartment, hermetically sealed, is placed a liquid which boils, forming steam or vapor, at sixty degrees. When cold this vapor condenses and forms a partial vacuum in the chamber, and the diaphragm is forced over closely against the front or smooth wall of the thermostat by the pressure of the air on the other side. The thermostat is hung upon the wall of a central room. Connected with the space back of the diaphragm is a small lead pipe which leads down inside the partition and connects with the hot water regulator shown in Fig. 2. The pressure in the thermostat, which varies with every change of temperature, being transmitted through the lead tube, results in a corresponding movement, up or down, of the lever to which the dampers are connected, and they are thus opened and closed exactly in accordance with the existing temperature in the house. The motion of the dampers is gradual, giving just the amount of air required at all times, thus maintaining perfect control of the fuel and securing thorough combustion of the fuel and uniformity of temperature.



POWERS DUPLEX REGULATOR.—FIG 2.

NEW GURNEY HOT WATER HEATER.

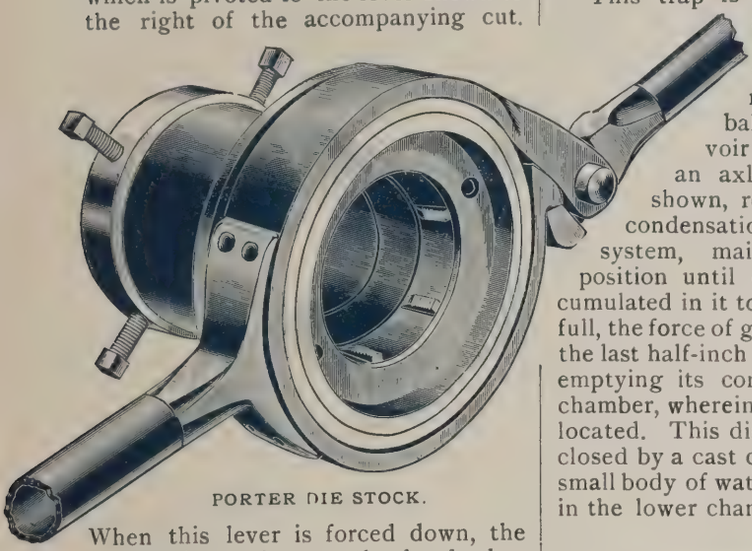
The accompanying cuts illustrate the Gurney style "A" double crown hot water heater, which the Gurney Hot Water Heater Co., 163 Franklin street, Boston, Mass., have recently added to their already well known line of hot water heaters and radiators. Previously they had only made two styles of this particular type of hot water heater, viz., style "B" and style "C," their capacities ranging from 1,200 to 6,000 feet of radiation. The style "A" differs from the style "B" and "C," in some few particulars. It is made with a shell base, and diving flue, having both direct and indirect draft. The position of the fire is at the top of the heater, similar to the two former styles, and it comes in contact with large heating surfaces directly over the fire. The general idea applied to their style "B" and style "C," with which the trade are very familiar, is carried out in this heater, which is made in three sizes, and has capacities of 600, 800, and 1,000 square feet of direct radiating surface, respectively.



GURNEY HOT WATER HEATER.

PORTER PIPE THREADING STOCK.

This stock is a simple and convenient tool for threading large pipe. The head is gripped by a flexible iron hoop like a friction brake band, one end of which is pivoted to the lever shown to the right of the accompanying cut.

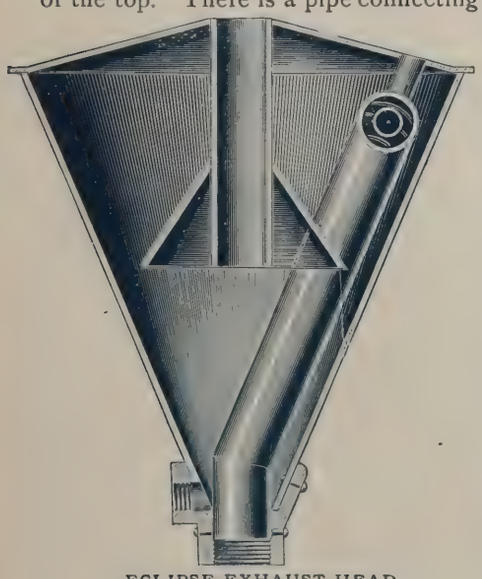


PORTER DIE STOCK.

When this lever is forced down, the band grips and turns the head, thus cutting the thread. The upward thrust of the lever, given it at the end of a downward stroke of convenient length, releases the grip, making the action exactly similar to a friction ratchet. The manufacturers, Porter Radiator & Iron Co, Minneapolis, Minn., state that two men can cut a 6-inch thread in 10 minutes with the greatest ease. The head is substantial and durable, a No. 2 stock which has been in constant use for the past two years in the shops of the manufacturers, showing no appreciable wear.

ECLIPSE EXHAUST HEAD.

In the exhaust head shown in the accompanying sectional cut the exhaust steam as it enters the head is carried up to near the top, then discharged horizontally around the head, giving the steam a whirling or centrifugal motion, and driving the heavy matter to the outer walls whence it flows down the sides to the drip, while the light dry steam escapes through the center of the top. There is a pipe connecting

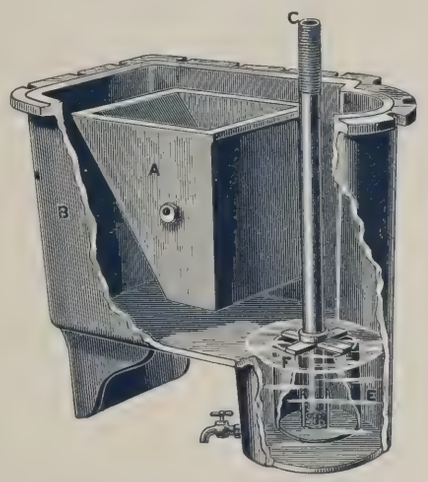


ECLIPSE EXHAUST HEAD.

the outside of the head and the exhaust pipe in such a manner as to cause a suction when steam is going through, thereby drawing cold air into the head and securing further condensation. The New York Exhaust & Blow Pipe Co., 136 Liberty street, New York, are the manufacturers.

STIFEL'S POSITIVE STEAM TRAP.

This trap is the invention of the superintendent of the N. O. Nelson Mfg. Co., of St. Louis, who manufacture it. The balanced cast iron reservoir *A*, which swings on an axle within the trap, as shown, receives the water of condensation from the heating system, maintaining an upright position until enough water has accumulated in it to nearly fill it. When full, the force of gravity applied through the last half-inch of water tilts the tank, emptying its contents into the lower chamber, wherein the discharge valve is located. This discharge valve is kept closed by a cast cup *F* which floats in a small body of water constantly standing in the lower chamber *E*, as well as the

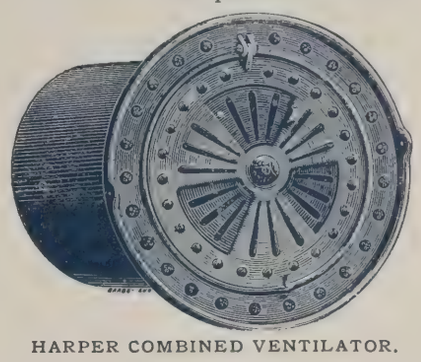


STIFEL'S POSITIVE STEAM TRAP.

cup *F*. When filled, the cup sinks to the bottom, thereby opening the discharge pipe *C*, through which the water is forced by the steam pressure in the chamber, until the cup has been emptied, when the latter again floats and closes the discharge. Meanwhile the reservoir has swung back into position, and until it is again filled to the tilting point the trap remains absolutely closed.

HARPER COMBINED VENTILATOR.

The combined thimble, flue stopper, collar, and ventilator illustrated herewith consists of a cast-iron thimble and outside rim plate, also a hinged plate on which is a flue stopper and register. The thimble is placed in the chimney, where the face plate is fastened to the thimble by two small screw bolts. There are two small raised parts on the rim plate through which are holes for wiring the stove pipe. When the stove pipe is inserted the flue stop is raised and rests on the top of the stove pipe. When the pipe is taken down this plate is shut down, as shown in the cut, and fastened with a pin. The hole in the thimble near the inner end is for an anchor pin. The manufacturers claim that the device can be securely anchored in the chimney; that it is a positive protection from fire caused by flues burning out; that the flue stopper is positively tight and soot proof; that it provides for wiring the stove pipe and does away with the necessity of defacing the walls with nails, and that the thimble is so constructed and placed in the chim-

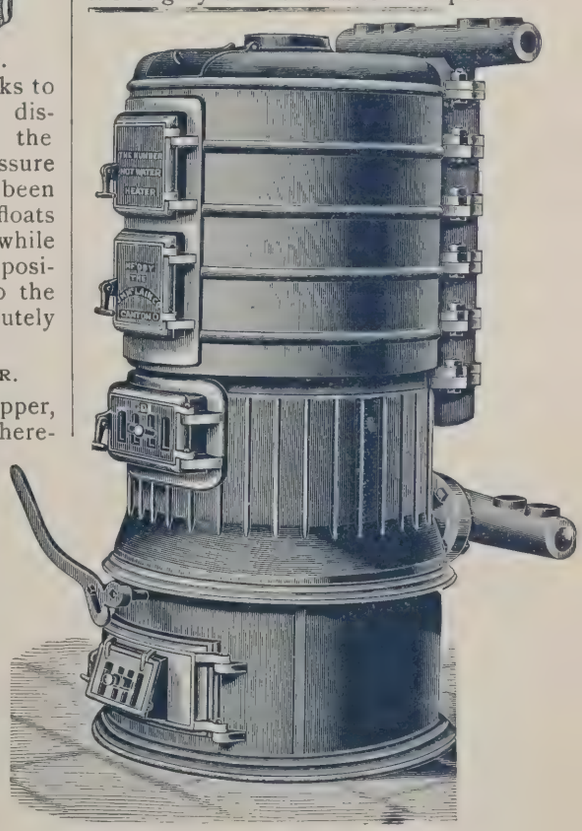


HARPER COMBINED VENTILATOR.

ney that the stove pipe will not push into the flue so far as to cut off the draft. The Harper Mfg. Co., Peoria, Ill., are the manufacturers.

HUMBER HOT WATER HEATER.

In the construction of this heater the manufacturers state that their aim has been to secure complete combustion in the fire chamber and to interfere as little as possible with the natural flow of water. The fire pot is corrugated on the inside down to the grate, which is beveled on the lower edge so as to prevent the accumulation of ashes and to give a space for air to ascend the sides, thus securing better combustion of the fuel. The grate is both oscillating and dumping, heavy and durable. Its connections are below the fire, and fastened with nut and spring cotter. The sections are so arranged as to thoroughly mix the water and prevent



HUMBER HOT WATER HEATER.

ebullition. The Humber heater is manufactured by the J. H. McLain Co., Canton, O, who are old hands in the business.

Heating and Ventilation

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THE value of experience is inestimable. It is especially so in any occupation requiring the constant exercise of sound judgment. A knowledge of principles, no matter how profound, will not alone insure a wise application of them in human affairs and occupations. The old maxim that "practice makes perfect," if it were amended to read "practice tends toward perfection," would express a truth that all might find it profitable to remember and apply, whether their special calling be that of a hod-carrier or a gentleman of leisure. It requires much practice to fill well even the latter role; and many cut a very sorry figure when they attempt it. WE entirely and unreservedly accept the proposition that men of experience are safer than men who have merely theoretical knowledge; yet, there are men who have had great experience who are not safe in undertakings involving features wherein they have not had experience, nor, always, in matters limited by the lines of their special experience. Are any such men to be found in the business of erecting heating and ventilating appliances? The question may be answered respectively by two different classes of men; the first represented by an owner who is suffering the inconveniences and annoyances of a badly erected plant in his residence or offices; the second, by the erector of such plants who has one or more competitors that contrive to frequently underbid him in his estimates for contracts, and, in many ways, to cut into his business more or less. Each of these representatives of suffering humanity will say that lots of experience will not always make it sure that those who have it will be able to do the best work; and each will, in so answering, speak the truth.

WHY is it that, notwithstanding the admitted value of experience, many who possess it yet make gross errors in judgment, and are guilty of mistakes that some men who have had far less practice would never commit? Not that the latter are incapable of errors. They will also sometimes blunder; but their blunders will be of a different sort. They will learn something from their mistakes; and when they have had as much practice as the former they will far less frequently fall into error. The reason is that they are thoroughly familiar with fundamental principles. The full benefit of practical experience is only available to men of this kind. It is only by the study of the facts of experience in the full light of general principles that many of these facts can be properly interpreted and comprehended. Things frequently occur in the operation of heating and ventilating apparatus that are puzzling in the extreme, so far as light gained only from common experience can afford any explanation of them in the absence of theoretical knowledge. The purely practical man will almost surely frame some sort of an explanation; but when he has formulated it, it will often be of about the same value as that of the darky with reference to the lumbago that afflicted his "ole grandmother"—"Something gone wrong with de spine of de vertebratal column of de backbone."

LET those who are intending to enter upon that branch of engineering which deals with heating and ventilation bear well in mind that there is no high place in it for men who are not well versed in the laws of heat, its transmission and diffusion, and the laws that govern the movements of fluids, whether liquids or gases. There is no high place for such as are not familiar with the nature of the noxious substances which it is the purpose of ventilation to remove, the causes that interfere with their removal, and the tests by which their presence may be determined quantitatively, as well as those by which their removal to the desired extent may be demonstrated. No top position awaits such as do not know the laws that govern the action of appliances for generating heat, steam, and hot water, the properties of steam, its behavior under different conditions, and the theory of its action in steam engines. Neither is there any commanding eminence in this business for the purely theoretical man. But to such as combine practical experience with theoretical knowledge of a high order, and who unite business ability with integrity, thus winning public confidence both for professional skill and commercial honor, there is scarcely any more promising field of enterprise; and for such success may be reasonably expected if they have the nerve and physical stamina to meet and endure the disappointments and perplexities which, it must be confessed, are peculiarly numerous and trying in this profession, yet perhaps not more so than are met with in other branches of engineering.

APPROPRIATELY to what has been said of the necessity for both practical and theoretical knowledge we may, without undue egotism, speak of our publication as the first periodical entirely devoted to the diffusion of such information upon the science and the arts of heating and ventilation. We think we may refer with justifiable pride to the character of the contents of any number which has yet appeared, and with confidence challenge the profession to name any publication of equal value to men who are engaged in these arts. In it both theory and practice have been treated by some of their ablest exponents; and it will be our aim in the future to maintain in every way the high standard of excellence which we adopted at the outset. From many quarters we are receiving the assurance that HEATING AND VENTILATION is filling a long and urgently felt void in the technical literature of the time; and we have, from this encouragement, a well grounded hope that in point of circulation and popularity in the heating trade, and among those who, not directly interested in heating and ventilation as a business but more or less indirectly concerned with these arts as owners, architects, or builders, or in the supply of materials and appliances used in these arts, we shall soon not only lead, but pre-eminently lead.

LETTERS FROM PRACTICAL MEN.

Correspondence from practical men upon topics of interest relating to Heating, Ventilating, and kindred subjects, will find a place in this department. The editors, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

Estimating Heating Surfaces.

I find the following interesting question and answer in one of your plumbing contemporaries: "Will you please tell me how to measure a room to find the necessary heating surface.—E. C. S., Philadelphia. [You first want to find the cubic feet. This is ascertained by multiplying the length by the breadth, and then by the height from floor to ceiling. Then you have the cubic feet. Every ten cubic feet is supposed to require one foot of heating surface, but that depends of course greatly upon the building. —Ed.]"

I should imagine that the editor intended the above rule to apply to heating a room in the vicinity of the north pole instead of Philadelphia. The inhabitants of the Quaker City, however, have a reputation for slowness, and he may think that this ratio heating surface might enliven them. At of events I think it would have a tendency to all drive them out of the room in a hurry. D. L. W.

An Explanation Wanted.

In the November issue of Heating and Ventilation "Knight" makes the following statement: "It must be understood that it requires the same size of boiler to warm a given house whether you employ steam or water as a circulating medium, and that, if the boiler has been selected to carry a sufficient number of feet of steam radiation to do a certain work, that boiler is large enough to supply any number of feet of water radiation which may afterwards be selected to warm the place in question."

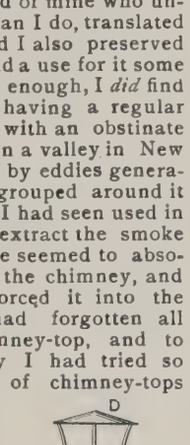
While a properly proportioned steam boiler supplying a given amount of steam radiation would be large enough to warm the same space, if connected with sufficient water radiation,—providing the construction of the boiler will allow free circulation,—I cannot see how a hot-water heater running at its full capacity can be expected to generate steam to heat the same space when connected with steam radiation. Practically speaking, one square foot of fire surface will carry twice the amount of water radiation as it will steam. As it never requires twice the amount of water radiation to accomplish the results obtained when using steam, an explanation from "Knight" will be appreciated. A. C. E.

Circulation of Water Through Radiator.

In stating the problem on this subject in your December issue an item which it will be necessary to have in order to make it a definite question has been omitted. This item is the cooling between the entering and return water. It is not stated how many degrees the water is cooled in passing through the radiator. Under average conditions the water in circulation through a radiator would cool from 15 to 20 degrees. If the entering water was at 200 degrees, and the water when leaving the radiator at 180 degrees, or 20 degrees cooler, the average temperature of the surface will be 190 degrees, making a difference of 120 degrees between the air in the room and the average temperature of the surface. Allowing a discharge of $1\frac{7}{10}$ units of heat per hour per square foot of rated surface per degree difference in the temperatures, and assuming that there is given out through the radiator a total of 10,200 units of heat per hour, 90 pounds of water will be cooled 20 degrees for each time the radiator is emptied. Ninety pounds of water cooled 20 degrees represents a loss of 1,800 units of heat. In order to supply the 10,200 units of heat necessary for the maintenance of the temperature of the room we would have to pass through the radiator about 5.0 pounds of water. In other words, to meet the conditions stated in the question in the December issue, it would be necessary that the radiator be emptied about $5\frac{1}{2}$ times per hour. It will be seen from the above how important a part is played in the problem by the number of degrees cooling between the entering and return water. The figures assumed are perhaps extreme, and would be but rarely met with in ordinary practice; at the same time they illustrate one method by which this matter of the circulation in a radiator may be correctly calculated. Hot Water.

French Siphon Chimney Top.

Away back in 1866, being then in Paris, I picked up a French paper in which was illustrated and described the chimney-top shown in the accompanying engraving, which at the time I cut out and preserved for future reference. A friend of mine who understands French better than I do, translated the description for me, and I also preserved that, expecting I might find a use for it some time or other. Well, sure enough, I *did* find a use for it. I had been having a regular parrot and monkey fight with an obstinate chimney, which, located in a valley in New England, was so pestered by eddies generated by the effect of hills grouped around it that all the chimney tops I had seen used in Massachusetts could not extract the smoke from it. Why, that smoke seemed to absolutely take solid form in the chimney, and a downward pressure forced it into the building in chunks. I had forgotten all about this French chimney-top, and to cure my smoky chimney I had tried so many different forms of chimney-tops that some of my friends began to nick-name me "Chimney-top Joe." Really, though I am writing about it jestingly, the thing was no joke to me at the time it happened. I needed the pay for that job of work at the time more than I ever needed money before or since in my life; and the trustees of the church (the building was a church), besides obstinately refusing to pay me for the job, began to threaten to throw it out altogether. Returning home one evening, thoroughly disgusted and discouraged from a futile attempt to make the chimney work better, all at once the recollection of this chimney-top and my translated description of it flashed across my mind. I immediately instituted a search among long hidden memoranda, and after a little while found it. Reading over the description, I felt some encouragement that this might remove the cause of my worriment. Next day I had a top of this pattern made and put on the chimney, and it has worked for six years without giving any further trouble.



If any of my brethren in the craft have occasion to deal with a chimney of a building overtopped by closely surrounding hills, I advise them to make a trial of this cheap device. My translation states that this top was invented by a French architect, and further states the following particulars essential to its construction and operation. A flange pipe *A* fits into the top of the chimney and receives the vertical pipe *B*. This pipe is slightly conical, and near the top has three conical pipes or siphons *C*, which turn the currents of air so that they favor the draft. The siphon pipes are placed at angles of 120 degrees from each other, and inclined downward as shown. The description states that it is important to make the orifices of intersection tangential to each other, so as to permit air entering one of them to issue from both the others. It is also stated that the dimensions of these tops should be larger the greater the distance between the fire and the external orifice of the chimney. Lucas.

The Effect of Winds on Heating.

While on general principles it cannot be denied that the effect of winds upon the heating of buildings is adverse, and must be taken into account in estimating the amount of heating surface required, this, like other general propositions, is subject to exceptions in its practical application. For instance, in a case where the colder prevailing winds assist the draft, it may often be found easier to heat a building when these winds are blowing than when the outside air is still. But, of course, while the building is apparently easier to heat when the winds are blowing, it would be found in most such cases that more fuel is required to attain the required temperature. Even this would not constantly be the rule. When combustion is imperfect through deficient draft, it not unfrequently happens that more fuel is consumed (not really, but *apparently*) than would be necessary were the draft as energetic as is necessary for perfect combustion. Neither excess nor deficiency in draft are desirable for highest economy in fuel consumption. There may be times when the effect of winds, independently of their influence upon draft of chimneys, may effectually aid the heating of buildings; and this may have an important bearing upon results obtained in testing newly erected apparatus. Let us suppose that for three or four days previous to a test a strong wind has been blowing, at a temperature of say 40 degrees. The walls of the building will have taken substantially this temperature. On the day of the test let us also suppose a sudden change of outside temperature and a shifting of wind to a different quarter, the thermometer standing outside marking within a few hours a temperature of say 12 degrees. Changes as extreme as this, and even through wider ranges, in the course of three or four hours, are common in many parts of the United States. Now it probably would take ten or twelve hours for a brick wall of average thickness to cool from 40 down to 12 degrees. In such a case the heat remaining in the walls would materially assist in warming the building. A temperature of 12 degrees would be generally considered as sufficiently near the zero point for a satisfactory test in climates where zero is about the lowest temperature ever reached, especially if a strong wind be blowing. Yet it must be obvious that in the case mentioned a test might be misleading. The same may be said of a test made immediately after a cold term while a warm wind is blowing. Many anomalies in the action of heating apparatus can only be explained by a consideration of the effects of winds. Probably many of your readers have had experience in this line which would be interesting reading if communicated to these columns.

L. A.

Ventilation in Workshops.

Up to the present time I have not noticed anything in your paper on the proper ventilation of machine shops and other workshops. The importance of this subject has, I think, been overlooked by both employer and workman. I am inclined to believe that it has a greater effect on the result of a year's business than the employer supposes, and that if a good system of ventilation were installed in every workshop in the land, the increased output of the shops would more than pay the interest on the money invested. Besides this, the workman would escape "the subtle poison of unrenewed air which does its deadly work in the form of pneumonia." I should like to have some of your contributors tell how ventilation can be best secured in this class of buildings, and would like to call your readers' attention to the following paragraph from the *American Machinist*: "In one essential feature the majority of machine shops in this country, perhaps in all countries, are lacking; that is, they are improperly ventilated. One is often struck, upon going from the open air to a busy shop, with a sense of the unhealthy condition of the air, charged with metallic dust, which workmen must

breathe over and over. Workingmen cannot do justice to themselves in such atmosphere, and it is not only a question of health to them, but as well one of profit to the employer, to provide for its systematic removal. From the character of the work done in machine shops, especially where considerable cast iron is worked, good ventilation is very important and ought to receive more attention."

As showing the condition of the workshops in England, I have taken the following from a report of a medical inspection of workshops by the Public Health Department of the London County Council: "In no case," says the report, "was any artificial means of ventilation seen. Such interchange of air as might occur could only be brought about by the 'natural ventilation' afforded by the chimney flue and other openings—windows and doors. A note was made of all windows which were not found shut. In the 114 workshops inspected there were in all only 11 in which open windows were found. One master, on being asked whether the windows were ever open, replied: 'Only in the spring and summer months.' Another master excused the overcrowded condition of his workroom by remarking that when the workpeople felt the air to be close and oppressive he did not allow them to remain in one place, but caused them to move about from one part of the room to another.' It appears to be questionable whether any attempt is ever made during the winter months to cause a current of cool fresh air to circulate through some of these workrooms." W. C.

Evans Exhaust Hot Water Heating System.

In an article appearing in the December number of HEATING AND VENTILATION, criticising the Evans exhaust hot water system, I notice that I am credited with having been connected with the high pressure hot water heating system constructed in Boston some years ago.

This has undoubtedly been done under misapprehension. I respectfully inform you that I never had any official or technical connection with the Boston scheme.

As an engineer, I was frequently asked by personal friends my opinion of the proposed system, and in every instance expressed my disapproval and firm belief that the system was impracticable in many features, the ultimate results proving that my analysis of the system was correct.

I have never in any instance commented upon or criticised the Holly system of steam heating, and therefore disclaim any necessity of taking up valuable time to reply to the statements of Mr. Babcock or to answer his challenge regarding the Holly system.

I stand by all statements appearing in public journals authorized over my own signature, and do not make it a practice to commit myself on any point without having demonstrated in advance the soundness of my position.

All practical engineers will readily recognize that there is frequently more than one way of accomplishing the same purpose by methods equally economical.

I now ask that you will kindly correct the erroneous statement above referred to, and as publicly as it has appeared.

J. H. VAIL.

NEWS AND NOTES.

New York City.

During the year of 1893 it is reported that Supt. Brady of the Building Department approved plans for 2,300 new buildings, involving a total expenditure of $54,859,318, and for alterations on 2,010 buildings at a total estimated cost of $6,804,527.

The Clearing House Association will erect a new clearing house building, the site for the purpose, 77, 79, and 81 Cedar street, having been purchased for $375,000.

The congregation of St. Matthews Protestant Episcopal Church will build a new church on West Eighty-fourth street, near the Park.

Messrs. Gross, Souer & Herbert purpose building four five-story brick flats on the southwest corner of West End avenue and 88th street; also four similar buildings on the southwest corner of West End avenue and 89th street. Frank Weanover is the architect for both sets of buildings, which will cost $158,000. A permit has been granted Isabella Leo for the erection of five three-story dwellings on the north side of 145th street, 150 feet west of the Boulevard. The architect is John P. Leo. Cost, $38,500,

Messrs. Neville & Bagge have furnished plans for seven four-story brick and brownstone front dwellings to be built on the north side of 142d street, 200 feet east of Willis avenue. Each dwelling is arranged to accommodate eight families. Their client is Jas. S. Barry, of 176 Willis avenue. Cost, $112,000.

Geo. Schreimer, of 104 West 121st street, has engaged John Hauser to prepare plans for three five-story brick dwellings to be erected on the south side of 90th street, 210 feet east of 3d avenue, at a cost of $61 000.

Plans have been approved for the erection of a four-story brick structure to be used by the New York Protestant Episcopal City Mission. The architects are Messrs. Harney & Purdy, and the estimated cost is $36,-000.

The Board of Home and Foreign Missions of the Presbyterian Church are contemplating the erection of a $1,000,000 ten-story office building at the corner of Fifth avenue and Twentieth street. It may not be plain in what way the expenditure of this large amount of money in a building will assist the foreign heathen, but it will certainly assist the local architects and builders. J. Bockel & Son are architects for a five-story brick building to be built on the southwest corner of Sixth avenue and 18th street, for Mr. Geo. H. Beyer. The cost will be about $48 000. The same architects have also prepared for Mr. Beyer plans for two 5-story brick stores and lofts to be erected on the west side of Sixth avenue, 39 feet south of Eighteenth street, at a cost of $52,000.

Messrs. Lindsay & Johnson will build seven 3-story frame private dwellings on 71st street at a cost of $175,000; John C. Burns, architect.

Charles Buck, 264 Columbus avenue, will build six 4-story private residences on W. 78th street at a cost of $96,000; Henry F. Cook, architect.

Samuel Otto will erect two 5-story brick flats at 433 and 435 East 117th street at a cost of 44,000; Charles Rentz, architect.

Messrs. Keary & Dunden, of Fordham, N. Y., will erect a $15,000 club house on the corner of Morris avenue and Kingsbridge Road; John S. O'Meara, architect.

Henry Zullch will erect a 5-story brick flat and store at 413 West 35th street at a cost of $20,000; Geo. F. Pelham, architect.

Geo. G. Wanzer and Ernest Koch, 1712 East End avenue, will erect four 5-story brick dwellings on 69th street at a cost of $72,000; Edward Wenz, architect.

The Phoenix Estate, 112 Broadway, will erect a 4-story brick factory at 191-193 Delancey street at a cost of $15,000; Frederick Ebling, architect.

The trustees of the Scotch Presbyterian Church of 95th street and Central Park, west, will erect a one-story brick church on the corner of 96th street and Central Park, west, at a cost of $100,000; Wm. H. Hune, architect.

Manager Henry E. Abbey will erect a handsome residence at 114-116 West 47th street. He has purchased the two 3-story dwellings now on the site, paying $35,000 for it.

Philip Braender, 156 East 93d street, will construct six 5-story brick flats on 101st street, 200 feet east of Amsterdam avenue, at a cost of $90,000; Messrs. Cleverdon & Putzel, architects.

Messrs. Delafield, 11 West 45th street, and Stuyvesant, Bay Shore, L. I., are to build a 6-story brick store building at 247 South street at a cost of $30,000.

Laura Streifer will erect a 5-story brick flat on the west side of Bradhurst avenue, 360 feet south of 145th street, at a cost of $16,500; Wm. A. O'Hea, architect.

Morris Alexander, president of the Ladies' Deborah Nursery and Child's Protectory, of 21 Centre street, will erect a 3-story brick building to be used as an orphan asylum, on the west side of Eagle avenue, 75 feet south of 162d street, at a cost of $30,000; Max Muller, architect.

Peter M. Wilson, 144 West 22d street, will erect a 7-story brick factory on Bethune street, between Hudson and Greenwich streets, at a cost of $25,000; Messrs. Lederle & Co., architects.

Peter Fuchs, No. 1201 Bloomfield street Hoboken, is to construct two 5-story brick flats on the south side of 94th street, 80 feet west of Park avenue; A. B. Ogden & Sons, architect. Cost, $33,000.

Solomon Mathews will build a 6-story brick flat on the northeast corner of Montgomery and Henry streets; Max Muller, architect. Cost, $26,000.

Messrs. Michael Fay and William Stacum are to erect three 5-story brick flats at 90, 92, and 94 Sheriff street; Charles Bentz, architect. Cost, $66,000.

John Yule, 134 West 96th street, will erect two 5-story brick flats on 84th street near Columbus avenue, at a cost of $40,000; T. E. Thomson, architect.

Charles Scribner's Sons, 745 Broadway, will erect a 6-story office building at 151-155 Fifth avenue, at a cost of $40,000; Ernest & Flagg, architects.

Geo. A. Hearn will build a 7-story brick hotel at 33 West 12th street, at a cost of $35,000; John B. Snook & Sons, architects.

Bertha Volkening will build a 3-story brick factory on 53d street near 11th avenue at a cost of $25,000; Charles Baxter, architect.

Frederic Aldhaus, 513 Lenox avenue, will erect five 5-story brick dwellings on 75th street, near Amsterdam avenue, at a cost of $125,000; John C. Burne, architect.

Jonas Well and Bernard Mayer, 227 East 60th street, will erect three 5-story brick flats on 9th avenue, near 28th street, at a cost of $69,000; Schneider & Herter, architects.

Robert Robertson will erect an 8-story brick flat on the corner of 72d street and Western Boulevard at a cost of $300,000; Andrew Craig, architect.

Philadelphia.

The first week of 1894 did not bring out many new building operations, the largest being that of James and John Maguire for the erection of forty-two 2-story dwellings on Lehigh avenue and Learney street. Ground has been broken for these buildings, and if the winter remains open the work will be continued.

Money for big operations is very scarce, and the builders, without financial backing, cannot progress. Where, in years gone by, the trust companies were always ready and anxious to advance money on new work, to-day the same companies cannot see the way clear. If a person wants to borrow money on a mortgage on approved realty security, of course it is forthcoming, because that is the kind of an investment which the trust companies most desire, but if a builder wants help to carry him along during the time between the beginning of an operation and the sale of the houses, then there is at once a difference shown, unless there is a great big margin. To put it tersely, money for mortgages is plentiful, but bullion for building is shy.

Eleven 2-story brick dwellings will be erected by W. A. Margarem on Oakford street, West of 26th. Henry Kock will erect a 3-story brick factory at 868 North Fourth street.

Work has been begun on the new building for the William Mann Company, at the corner of Fifth and Commerce streets. George F. Payne & Co., have the contract, and the structure, which is to be of brick and iron, eight stories high, will cost about $80,000.

C. F. Gallagher will erect four 2-story dwellings on Mifflin street, West of 19th. Johnston & Byrnes will erect a 3-story school house on 17th street, north of Tasker. John Loughran will erect ten 2-story brick houses on Colorado street, north of Huntingdon.

It is rumored that an immense apartment house will be erected at 18th and Pine streets. This class of buildings seems to be growing in favor here in Philadelphia.

The proposed Manual and Training School to be established and conducted in connection with the public schools of the city bids fair to soon have an existence in fact. Arrangements are now being completed by Daniel Baugh, Arthur Biddle and Dr. Pepper and others prominently interested in the scheme by which the sixteen acres of ground near the Almshouse recently set aside for this purpose is to be transferred to them. It is then proposed to form a corporation which will hold both exhibits and land in trust for the city and to raise an endowment fund of $50,000.

The Property Committee of the Board of Education have awarded the following contracts for heating schoolhouses: Heating new addition to Lynd School, Twentieth section, Davis & Gorman Company, $200; heating new addition to Manayunk School, Twenty first section, Philadelphia Steam Heating Company, $1,547; heating and ventilating Whitehall School, Twenty third section, Philadelphia Steam Heating Company, $3192; heating addition to Bellevue School, Twenty-eighth section, J. A. Welt, $460; heating and ventilating Robert Morris School, Twenty-ninth section, Philadelphia Steam Heating Company, $5,383; heating and ventilating Bayard Taylor School, Thirty-third section, Thompson Brothers, $2,272; heating Fox Chase School, Thirty-fifth section, T. T. Rockett, $400.

A new Lutheran Church is to be erected at the corner of Nineteenth street and Germantown avenue, at a cost, when completed, of $60,000.

Chicago.

O. Vider will erect a four-story and basement apartment building on Garfield avenue, near Sedgwick street, at a cost of $20,000; Astling Bros., architects. These architects have also made plans for two apartment buildings to be erected on Newport avenue, near North Clark street, for John B. Johnson. They will be three stories and basement high; will cost about $16,000.

Pond & Pond have completed the plans for converting the temporary building of the Newberry Library, at the northwest corner of Oak and North State streets, into an apartment building, at a cost of about $65,000.

E. D. Robbins, of this city, has prepared plans for a theatre, office and hall building to be erected at Henderson, Ky., for the Pythian Building Association. Cost, $80,000.

Ruehl & Gotterdam have designed for Herman Paesler five 3-story flat buildings, to be erected on Douglas boulevard, at a cost of between $50,000 and $60,000.

Johnston Gregory will erect six 2-story and basement brick flats at 914–24 Fifty-seventh street, at a cost of $15,000. Allen B. Wrisley will erect a 6-story and basement brick warehouse at 483–85 Fifth avenue, at a cost of $20,000. The work on the armory of the first regiment has been begun. The new building will cost $150 000.

James Corse will erect a 3-story and basement apartment building at 4525 to 4531 Vincennes avenue, at a cost of $40,000.

Perley Hale, Manhattan building, is taking figures on a 3-story and basement store and apartment building to be erected at 3732–3740 Cottage Grove avenue, at a cost of $35,000. A four-story and basement hospital will be erected at 547-549 N. Francisco street for the Norwegian Tabitha Society, at a cost of $40,000. Steam heat and all improvements.

R. Bruce Watson, the architect, is said to have plans under way for a large apartment building to be erected on the North Side at a cost of $250,000. C. W. Brega will erect a 5-story and basement flat building at State and 13th streets at a cost of $30,000. Treat and Foltz, architects.

Flanders & Zimmerman, the architects who originally built the Haymarket Theater and office building, have planned and are supervising the reconstruction of the office part of the building, which was recently destroyed by fire. The reconstruction will cost between $50,000 and $60,000.

The Board of Education will erect a 3-story and basement school at Pape and 46th streets at a cost of $60,000. Richard Curran will erect two 4-story and basement brick flats at 4448-50 St. Lawrence avenue at a cost of $30,000. The People's Institute, located on VanBuren street, near Oakley avenue, will erect a $40,000 building, probably on the present site.

Robert S. Smith has completed plans for a handsome apartment building, the first story of which was put in some time ago, on Sixtieth street, between Madison avenue and South Park place, for Albert J Maher. It will be four stories high, and will cost about $30,000.

William Strippelman, National Life Building, has prepared plans for a clubhouse to be erected at Palos Park, Ill, for the Chicago Sharpshooters' Society. It will consist of two stories, attic, and basement. Cost, $25,000.

Adler & Sullivan are completing plans for a four-story and basement warehouse to be built by J. M. Ball, at the northeast corner of Taylor street and Fifth avenue, at a cost of about $20,000.

Shepley, Rutan & Coolidge are preparing plans for a handsome residence which Chauncey Blair will build on the west side of Drexel boulevard, between Forty-eighth and Forty-ninth streets, at a cost of about $100,000.

Jennie and Mundie have planned a beautiful residence for E. D. Winslow, to be built at Buena Park on Sheridan avenue. It will be two stories and attic high, and will be heated by hot water. The cost is estimated at twenty-two thousand dollars. The same architects have also designed for W. A. Newell three very attractive houses to be built at the intersection of Orchard street and Lincoln avenue. They will be three stories high and be heated by hot water. They will cost thirty thousand dollars.

N. H. Pruzu will erect a 2-story and basement brick dwelling at 4630 Dretel Boulevard, at a cost of $20,000.

A four-story and basement store and flat building is to be erected at 224 and 226 Twenty-second street, for F. R. Otis, after plans by C. M. Palmer. The building will cost about $20,000.

Contracts have been let for a warehouse and office building at 18 and 20 Taylor street for the Grand Trunk Railroad. The structure will be two stories high, and cost about $30,000.

L. Roos will erect a 4-story and basement brick building on the corner of Lincoln avenue and Wells street. Cost, $20,000.

J. T. Bunting will erect a 3-story and basement apartment house on the corner of Graceland and Clarendon avenues at a cost of $30,000; E. H. Turnock, architect.

Geo. Summers will erect a 3-story and basement brick residence at 2933 Michigan avenue at a cost of $20,000.

Boston.

The past year in building operations was not, in any sense, a bad one. Yet the anticipations of a majority of the trades were far from being realized. In looking over the record of Boston's building permits, it will be seen that the tendency has been largely to cheaper class of construction or more to wooden buildings than to brick and stone. There is a depreciation of over $2,000,000 alone in the latter class of construction over the record of 1892. Boston's wooden buildings exceeded the brick structures in number by about 1,300, and in cost by nearly $1,000,000 during the past year. It is confidentially expected that there will be a vigorous renewal of structural work in the early spring. The record shows considerable falling off in the building industry the past year, but, with real estate development in its present good shape, there is no reason for not experiencing a healthy and active building boom in Boston the coming season.

It is said that the Globe theater, which was recently destroyed by fire, will be rebuilt. Boston is to have a new $100,000 emergency hospital to be given by friends of Tuft's College, and in which Tuft's students will have exclusive clinical privileges.

Plans have been prepared by the city architect for a new six-room primary school building, to be erected at the corner of Moulton street and Moulton avenue, Charlestown.

Among new buildings in Boston residence districts will be a five-story building of light brick to be built corner of Minot and Billerica streets, by E. L Brodie, at a cost of $12,000. In the same district, Louis Pinauski will put up a three-story red brick building at 287 Causeway street, to cost $8 000. On Cotting court, a four-story double tenement block will be erected by Chas. Wyzanski. C. A. Halstrom, the architect, has plans under way for the erection of several new apartment houses in the North and West ends. A new iron and copper front with two-story addition is to be the chief feature of the remodelled building at No. 36 N. Market street, owned by the Williams estate, plans by J. C. Spofford, architect.

The South Unitarian Church corporation has purchased the Abbott Lawrence estate, cor. Commonwealth avenue and Charlesgate West, and will erect a building on the site for use in connection with church work.

Oliver Ames, Jr., has purchased two lots in the Back Bay district and will probably improve them by building a handsome residence. Another lot on the Bay State road has been transferred to F. H. Curtiss, assistant cashier of the Broadway National Bank, who will erect a private residence thereon from plans already under way.

The development of property in Roxbury, Dorchester, and Brookline has been on a large scale during the past season, and there will be a more extensive building boom than ever in these sections during the coming spring. The erection of moderate-priced tenements will be a feature in these suburbs. In Roxbury there is said to be a scarcity of this class of buildings, and rents are so high among present flat houses that many of them are unoccupied.

The vicinity of Egleston square is to be greatly improved next spring, and quite a number of new houses have been planned for erection. An unusual number of permits have recently been granted for West Roxbury. In Dorchester, the vicinity of Park, Merlin, and Kilton streets has seen the greatest activity. G. W. Davidson has just started the foundation of his fifth house on the last-named street. Property of about 100,000 square feet, located on Humboldt avenue, above Crawford street, is reported as under negotiations by certain Boston capitalists, the intention being to cut the property into house lots and erect medium-priced cottage houses thereon.

The new parental school buildings on the Matthew Bolles estate in West Roxbury are fast approaching completion and will be handsome and commodious buildings. The plans contemplate two dormitories alike and a domestics' building, in which will be the heating apparatus, kitchen and laundry. But one dormitory is now being constructed; the other is awaiting a further appropriation.

Brooklyn.

The following is a selected list of some of the permits which have recently been granted for the erection of new buildings:

On Vernon avenue, near Stuyvesant, two three-story brick dwellings. John Auer, owner; cost $10,000.

On Decatur street, near Broadway, eight two-story and basement brick dwellings. Robert L. Moores, owner; cost $28,000.

Four brick dwellings, north side of Fifty-sixth street, 145 feet east of Third avenue, three stories. Harry Stafford, Third avenue and Fifty-third street, owner; $16,000.

At the southeast corner of Varet and Morrell streets, a five-story brick dwelling. Halpern & Drechsler, owners; cost $8,500.

On Decatur street, near Hopkinson avenue, five two-story and basement brick dwellings. John F. Graham, owner; cost $20,000

On Fifty-fourth street, near Fourth avenue, three two-story and basement brick dwellings. Alexander Waldron, owner; cost $12,000.

BUSINESS NOTES.

The Kernan Furnace Co., of Utica, N. Y., have increased their capital stock from $20,000 to $50,000.

The Syracuse Stove Works will be represented in western New York during 1894 by George N. Pickstock.

The post office address of the new works of Bignall & Keeler Mfg. Co., of St. Louis, Mo., is Edwardsville, Ill.

J. E. Allen has assumed the management of the Boston store of Richardson and Boyton Company, 94 Union street that city.

The Geo. P. Steel Iron Co. have removed their general offices from 817 Filbert street to Rooms 1225-1227 Betz building, Philadelphia, Pa.

The Wrought Iron Range Co., of St. Louis, will exhibit at the California Mid-winter fair. They will also open a branch office in San Francisco soon.

The Magee Furnace Co., of Boston, Mass., have issued a new calendar for 1894, which is of a specially handy size, and is adorned with a handsome picture.

The Master Steam & Hot Water Fitter's Association have elected John W. Mills, a member of the Arbitration Committee, vice Herman A. Kroeschell, deceased.

The Danville Stove & Mfg. Co., of Danville, Pa., will be represented in New York and vicinity hereafter by Chas B. Hotchkiss, formerly with the Barstow Stove Co.

S. J. Williams, formerly with J. B. Cobb & Co., of New York city, has accepted the management of the New York office of the Model Heating Co., with offices at 305 Pearl street.

Manning, Maxwell & Moore, of New York city, have opened a western branch at Chicago, Ill. They have just issued a new catalogue costing them many thousands of dollars.

One of the neatest advertisements we have seen this year comes from the Illinois Heating Co., 88 Lake street, Chicago, Ill., in the way of a New Year's greeting. You must send for it to appreciate a good thing.

W. W. Glidden, formerly of Cincinnati, O., and C. B. Foster, of Chicago, have formed a partnership under firm name of Foster & Glidden and will act as consulting and contracting engineers. Offices, 58 Dearborn street, Chicago, Ill.

Clarence M. Woolley, secretary of the American Radiator Co., who has just returned from the Pacific Coast, is a great believer in the future of that country, which he thinks will show most important progress in the next few years.

Messrs. Hodge Bros., of Boston, are receiving the sympathy of the trade in the loss of their father, whose interment took place at Lowell, Mass., on the 14th inst. Mr. Hodge was an active, energetic business man, noted for strict honesty, and leaves many friends, who appreciated his sterling worth.

The Detroit Master Plumbers' Association, at a regular meeting held on Jan. 4, elected the following officers for 1894: President, James H. Crumley; vice-president, James W. Partland; recording secretary, Thomas F. Norris; financial secretary, W. I. Bolt; treasurer, Richard Walker; sergeant-at-arms, Ed. J. Ryan. The association is in a flourishing condition. The secretary's address is 54 Randolph street.

After March 1st, The Standard Radiator Co., and the Chicago Engineers Supply Co., will occupy the premises 167-169 Lake street, Chicago. Geo. E. Boylston of the Supply Co will look after the Standard's Chicago and Western interests, while the city salesman will be S. O. Duggar. Until March 1st, the above companies will be located at 108 Lake street. Storage room, affording ample facilities for the carrying of a large stock of radiators, will be provided at the new quarters when occupied. The Standard Co. will also open a New York office at 42 Dey street, with C. F. Gessert in charge.

At the annual meeting of the shareholders of the Superior Furnace Company, of Little Falls, N. Y., held on the 9th inst, the following officers were re-elected for 1894: president, Watts T. Loomis; vice-president, W. W. Whitman; treasurer, W. G. Milligan; secretary and general manager, W. H. Switzer. The company reports show a fair volume of trade for 1893, and while they are shut down for the present pending their annual inventory and repairs, yet it is expected to resume manufacturing at an early date to the extent that Superior furnaces and heaters may retain the popularity so long accorded to them by the trade at large.

James J. Ayer & Co. have opened offices in the Security Building, St. Louis, Mo., as consulting electrical and mechanical engineers. In matters of electrical construction work, such as electric lighting and street railway plants, Mr. Ayer has few equals, his knowledge having been recognized by the electrical fraternity in electing him to the presidency of the National Electric Light Association, which office he has recently resigned. He is also a member of the American Society of Mechanical Engineers. Mr. Broughton graduated from Cornell in 1890 as a mechanical and electrical engineer, and has been engaged for more than three years in practical work.

Exeter radiators have recently been placed in the following buildings: Y. M. C. A. building at Keene, N. H., 2,000 feet installed by Geo. M. Rossman; Town Alms House and Notre Dame Convent at Milford, Mass., installed by Henry Willers; City Hotel, Weaver's Restaurant and eight residences at Augusta, Me.; three residences at Ellsworth, Me.; Hotel Rumford, Rumford Falls, Me.; residences and stores at Waterville, Rockland, Gardenir, Fairfield, Farmingdale, and Narridgeworth, Me., installed by J. H. Coogan & Co., Augusta, Me.; McDonough House, Middletown, Conn., installed by James Donovan; Rhode Island Hospital, Merchants' National Bank, Providence Journal building, Barnaby Block, Free Baptist Church, Olneyville Public Library, Sheldon & Beirney Block, and Hazard Memorial Hall, Providence, R. I., all installed by F. Coggeshall.

T. C. Joy & Co., of 40 Centre street, New York, have issued a circular showing the number of new buildings for which their radiators have been specified. The list is a large and growing one About all the new schools in New York city have adopted them.

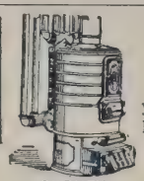
The Fowler Radiator Co., 435 N Broad street, Philadelphia, Pa., inform us that they have been very busy up to date, with a number of orders to be filled still on their books. They are now prepared to make the bases of their radiators with back openings so as to take air in above the floor in cases where the construction of the buildings demands the admission in that way.

Among the many heating plants installed by the Huyett & Smith Mfg. Co., Detroit, Mich., during the last few weeks of the past year are the following: St Michael's school, Newark, N. J.; Park school, Lincoln, Neb.; The Fred J Meyers Mfg Co, Hamilton, O; Elmira (N. Y.) Knitting Mills; Alfred Dolge, Dolgeville, N Y.; Illinois Glass Co., Alton, Ill.; North American Mill & Building Co., Stratford, Ont.; Altoona (Pa) Mfg. Co.; Intercolonial Railway of Canada, Moncton, N. B.; K. C., Ft. S & M. R. R., Springfield, Mo.; Menasha Wooden Ware Co., Menasha, Wis.

(Continued on page 23.)

Gurney

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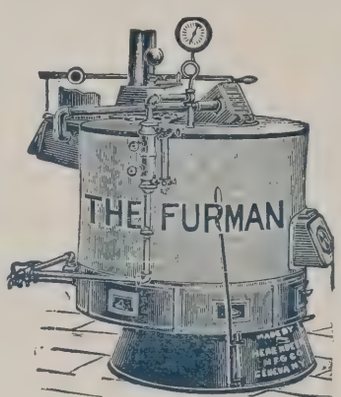
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The same in principle as previous patterns, but with larger bowl and vent, and several other improvements.



The seat is attached directly to the Pottery, dispensing altogether with Seat Brackets. The name "SANITAS" is synonymous with *Safety*, *Simplicity* and *Science*, and in no plumbing appliances are these qualities so perfectly combined as in the "SANITAS REGAL CLOSET."

Our New Catalogue for 1894 is now ready for Distribution.

Smith & Anthony Company,

54 Union St., BOSTON. 56 Beekman St., NEW YORK. 217 Lake St., CHICAGO.

The contract for heating the Union Depot at Portland, Oregon, now being built by the Northern Union and South Pacific Railroads, has been let to E. D. Hornbrook, Kansas City, Mo.

We are in receipt of special advance sheets from Fuller & Warren Co., showing a new furnace made in twenty different modifications and sizes, illustration of which will be found in our reading columns.

Hart & Crouse, of Utica, New York, are sending out samples of steel plate such as is used in construction of the Royal and Prince Royal furnaces. This steel is 14 wire gauge and is of the quality used in locomotive fire boxes. A very superior plate.

David Miller, for three years with the Boynton Furnace Co., and before that with Pease of Toronto and Gurney of Toronto, has become associated with the New York office of Hart & Crouse and will travel from that point, representing their full line.

Heat is Life, Cold is—is the title of a little circular sent out by the Howard Furnace Co. of Syracuse, N. Y., describing the comfortable features of the Howard heater. As an advertising novelty it at once attracts attention, and in a few lines states exactly the merits of the furnace.

Hart & Crouse, of Utica, New York, through W. M. Mackay, manager, have leased the store at 211 Water street, New York city, and will carry a full line of steam, hot water, and hot air goods in stock. The new store is an ample one and will allow of a beautiful display of their goods, and it goes without saying that Mackay will have a warm greeting for everyone.

Albert A. Cryer & Co. have leased the store at 85 Centre street, New York formerly occupied by the Morgan Boiler Co., and will show a fine line of the Richmond Stove Co.'s boilers, both for steam and hot water, for which the Cryer Co. will act as agents. Mr. Cryer has been very successful during '93 and has secured many excellent contracts. We all hope he will double them for '94.

The Pipers', Plumbers' and Metal Workers' Union of Portland, Maine, recently held a meeting at which the following officers were elected for 1894: President, D. E. McBride; vice-president, F. Mc Dermott; recording secretary, Gus Smith; financial secretary, James Reagan; treasurer, Thomas McBride; conductor, R. P. Berry; warden, R. P. Merrill; grand deputy, P. A. Mahoney.

Smith & Winchester, of Boston, on January 1st sold their entire interest to the Smith & Winchester Company. The new corporation will be under the same management and with increased facilities will be prepared to promptly execute all orders entrusted to them. The officers of the new company are: President, Ira P. Smith; treasurer, Henry H. Winchester; secretary, Newland E. Frost.

The Heat Control & Plumbing Co., Ltd., is the name of a new concern, established at 1721 Chestnut street, Philadelphia, Pa. J. C. Worthington, president L. S. Kern, secretary and treasurer, and O. L. Billings, manager heating department. The company will undertake the heating of houses, public buildings, general plumbing work, and the installation of electric light systems. They will make a specialty of the inspecting of heating systems. They will represent, as one feature, the Ridgway furnace.

The Utica Observer of December 20th has the following: The enterprising firm of Hart & Crouse, furnace, hot water and steam boiler manufacturers, have again added to their business by leasing the Eureka Mower Works foundry. They will take possession January 1st and after that will give employment to seventy workmen more than they now employ. Hart & Crouse are also awarding contracts for their extensive plant, which they are to build in East Utica next summer, their business having grown so extensive that their plant on Fayette and Camelia streets is no longer adequate. They will continue to occupy all three places.

The Toronto Radiator Mfg. Co., Toronto, Ont., in their annual greeting, which they send to architects and the trade, say, "In wishing all architects and heating engineers a very merry Christmas and a happy and most prosperous New Year, we hope that the season just closing will have been satisfactory, making due allowance for the stringency of the money markets and consequent stagnation of trade in many cities. We have to report a most successful season's trade, much in advance of 1892, and the future bids fair to be a golden one. We have striven to lead, and are still working to hold our position as the leading manufacturers of radiators in the Dominion. We make no idle boast when we claim to manufacture fully 80 per cent of all the radiators used in Canada. Our plant has been enlarged in many respects, and before many months we will have such extensions made that will enable us to lay claim to owning one of the largest (if not the largest) foundry plants in the world." This company has branch offices at Montreal, Quebec, St. John, Hamilton, Winnipeg and Victoria.

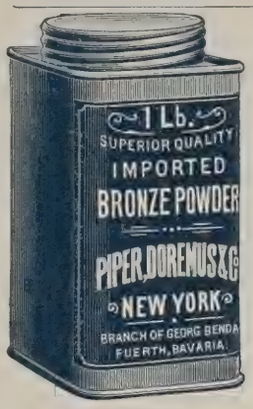
E. E. Palmer, State representative of the J. F. Pease Furnace Co., Syracuse, N. Y., has closed for Flinn & Breneman of Lancaster, Pa., contract for warming the elegant new brownstone residence of Samuel H. Reynolds, on North Duke street, Lancaster, the architect of which was Wilson Eyer, Jr., of 927 Chestnut street, Philadelphia, Pa. For this work will be specified one No. 320 low down steam and air combination heater, and the Excelsior indirect radiators manufactured by the American Radiator Co. The air supply to the air heating chamber of the heater will be built of brick and cement, placed under the cellar bottom, top arched with brick. This duct connects with an air room on the north side of the building. The air supply to the indirect radiators will be taken from a central air room through galvanized iron ducts, and all heat flues, pipes, and radiator casings are to be made of galvanized iron. All partition flues and wall pipes are to be protected throughout with asbestos covering, and outer wall pipes with hair felt. The casings for the indirect stacks are to be lined with asbestos, the inside lining to be of bright tin. There will be five direct radiators used in the following rooms, viz., billiard room, third floor, two servants' rooms on second floor, laundry on first floor, and toilet room under staircase.

Ira P. Smith and H. H. Winchester gave a complimentary dinner to the employees of Smith & Winchester Co., at the Quincy House, Boston, January 4th. An elaborate menu was served and all united in thanking the donors for the pleasant programme prepared for them. The health of the new company was pledged standing, and we are only sorry we were obliged to be absent. However, HEATING AND VENTILATION sends best wishes for the future success of the new company.

Giblin & Co. is the name of the new firm which succeeds to the business of Head's Iron Foundry of Utica, N. Y.

Codding & Taft, Worcester, Mass., have recently installed Exeter sectional boilers and radiators in James Kindred's 50-room apartment house, H. H Houghton's 60-room apartment house, Ward & Knowles' 40 room apartment house, J. F. Bickwell's office and dry rooms, J. S. Sargent, 5 greenhouses.

Continued on page 24.



Correspondence Solicited from Dealers and large Consumers.

$1.25 per pound. SUPERIOR QUALITY. $1.25 per pound.

Brilliant Pale Gold **RADIATOR BRONZE**

IN ONE-POUND TIN CANS, WITH SCREW CAPS.

Pale Gold and Rich Gold, $1.25 per lb. Orange and Copper, $1.25 per lb. Silver, $1.50 per lb.

Our best quality Radiating Bronzing Liquid, $1.50 per gallon, or 50 cents per quart.

Terms Cash, unless satisfactory References are furnished. Goods F. O. B., New York.

SPECIAL OFFER: Will prepay Express Charges on Bronze orders if Cash is sent with order.

QUALITY GUARANTEED.

PIPER, DOREMUS & CO.,

255-257 Greenwich Street, ... NEW YORK.

BEING IN THE BOILER BUSINESS.

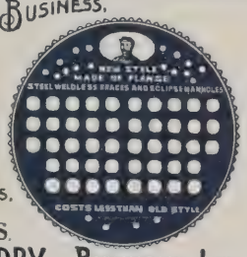
MAKING STATIONARY TUBULAR BOILERS EXCLUSIVELY.

WE CAN MAKE A BETTER **BOILER** AND ALTHOUGH WE MAKE THEM OF

FLANGE STEEL WITH **WELDLESS BRACES** AND **ECLIPSE MANHOLES**

SELL THEM FOR LESS MONEY THAN OLD STYLE ONES.

WE FURNISH NEATER LITHOGRAPHS AND DETAIL ILLUSTRATIONS OF THIS CLASS OF BOILER THAN ANY FIRM IN THE UNITED STATES.



FULTON STEAM BOILER WORKS AND FOUNDRY. RICHMOND, IND.

W. N. JENNINGS,

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103 Walker St., New York.

FINE CATALOGUE WORK A SPECIALTY.

STEAM PIPE AND BOILER COVERING.



Mineral Wool. Absolutely Fire-Proof and Perfect Non-Conductor.

Best on the market, light, durable and easily applied. Send for samples, prices, etc.

CHICAGO FIRE-PROOF COVERING CO.,

47 FRANKLIN STREET, CHICAGO.

BOSTON, 159 PEARL STREET. PITTSBURGH, 415 HUSSEY BLDG.

ORDER PLUMBING ORDER

GAS WATER STEAM

ORDER Supplies of ORDER

SMITH & WINCHESTER

19-37 WENDELL ST., BOSTON, MASS.

G. M. Davis & Co., of Chicago and New York have received an order for 1,000 of their No. 7 air valves for the new Stock Exchange Bldg., Chicago.

Hayes & Falls, of Rochester, N. Y., are heating the St. Mary's Boys' Orphan Asylum of that city by hot water, using the largest size Humber heaters made by J. H. McLain Co., Canton, Ohio.

Albert A. Cryer & Co., heating engineers, 85 Centre street, New York, are now engaged in placing a hot water system in a new church and parochial residence on 50th street and 5th avenue, Brooklyn, N. Y., using two Royal hot water heaters, manufactured by Hart & Crouse, 211 Water street, New York, the work being placed under the supervision of their manager, Mr. W. M. Mackay.

The Art Gallery Illustrated is the name of a publication issued by George Barrie, 1313 Walnut street, Philadelphia, which should be in the hands of all lovers of art. The work contains 336 full page half-tone engravings selected from photographs of nearly 2,000 works of art displayed at the World's Fair by Charles M. Kurtz, assistant chief of the art department. The price of the work is $1.25 in paper covers and $2.50 in cloth, gilt, red edges.

The Standard Radiator Co. have opened a Chicago office in the Chicago Engineers' Supply Co.'s large store at 108 Lake street, Chicago. The Standard Co. will have ample storage room for a large stock of goods, and they will be represented by their own salesmen. They will also open a New York office on Dey street, in the large store now occupied by C. F. Gessert, who will act as their representative in the metropolis and vicinity. This company report increased sales all round, and that their radiator is spoken of highly wherever used.

The Huyett & Smith Mfg. Co., Detroit, Mich., have issued a splendid new 125-page catalogue of ventilating fans, hot-blast apparatus, boilers, steam traps, dry kilns, engines, etc., etc., which should be in the hands of all of our readers who are interested in efficient heating and ventilation. The chairmen of school committees who may see this notice should not fail to secure a copy, and the factory owner should find it of interest. The Huyett & Smith Mfg. Co. is an old and well known concern and manufacture only the highest class of goods. The company is now doing a large business in foreign countries.

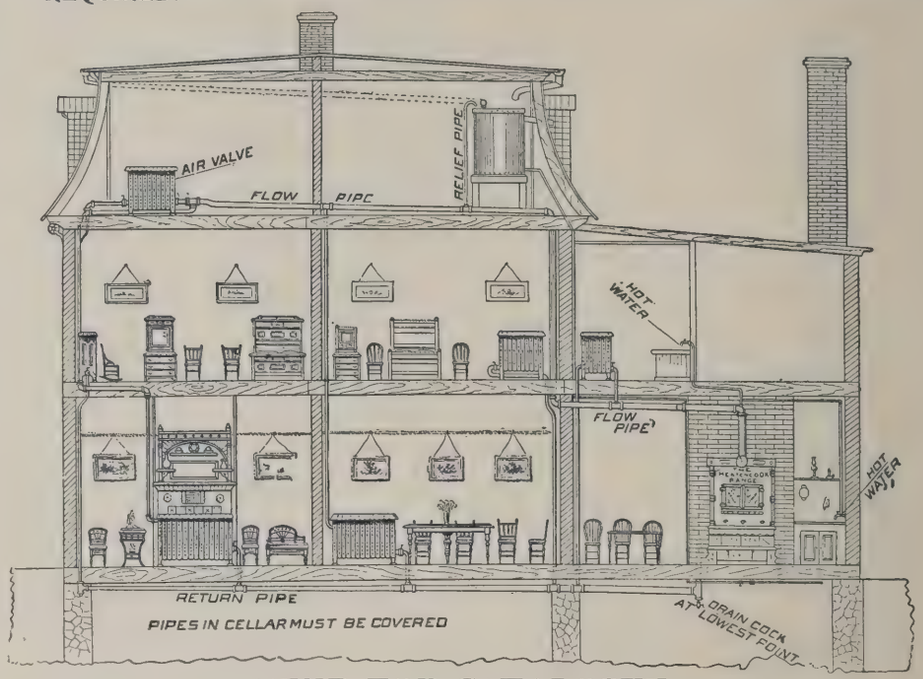
Hart & Crouse, 211 Water street, New York, report the following recent sales of Royal steam and hot water heaters: Church and parochial residence for the Redemptorist fathers, 50th street and 5th avenue, Brooklyn, N. Y., two heaters; the residences of A. L. Bailey, St. Johnsbury, Vt.; Mrs. C. K. Hetzel, Bay Side, L. I.; J. S. Perine, 128 Vroom street, Jersey City, N. J.; Geo. W. Rockerfellow, Plainfield, N. J.; Geo. E. Berna 632 West 145th street, New York; Dr. C. A. Wilson, Dubois, Pa.; Mrs. Emma Darling, Plainfield, N. J.; W. Potter, Mount Pleasant, N. J.; S. S. Whittelsey, Plattsburg, N. Y.; A. M. Brown, Keyport, N. J.; greenhouse of Capt. H. Hoffman, Plainfield, N. J.; conservatory of Hon. J. T. Clausen, Plainfield, N. J.; and the residence and green house of E. W. Schade, Wakefield, N. Y.

(*Continued on page xiv*)

THE "HEATENCOOK" RANGE

HOUSE HEATING from the KITCHEN FIRE.

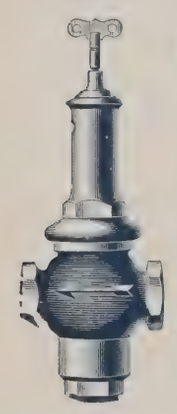
The **HEATENCOOK** is a special Range and Heater combined from which an entire house of moderate size can be successfully heated by **HOT WATER** from the **KITCHEN FIRE.** Several hundred are now in successful operation in all parts of the country and have been thoroughly tested during the past four years. Supplies hot water for the Bath and Kitchen sink. Saves a large percentage of coal. **ONLY ONE FIRE REQUIRED.**



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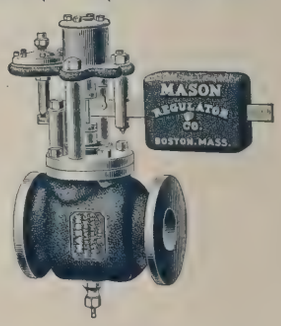
Sole Manufacturers. **YORK, PA.**



REDUCING VALVES.

This is the reducing valve which is used as the standard in the largest and best steam plants all over the world. 108 railroads use it as the standard. The Pennsylvania R. R. have over 1,000 in use.

ELEVATOR PUMP PRESSURE REGULATOR.



The most sensitive pump pressure regulator ever made. We have also adapted a portion of this to move the electric switch by the water pressure on electric elevator plants.

MASON REGULATOR CO., BOSTON, MASS.

Magnesia Sectional Coverings.

The best non-conductors of heat.—ECONOMICAL.
The most durable and most convenient in form.—ECONOMICAL.
The most reasonably priced, value for value.—ECONOMICAL.
They are used in the largest and finest establishments, among whom are



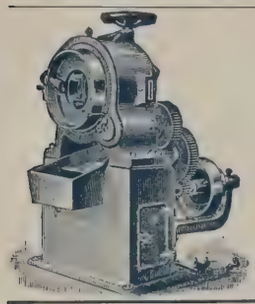


METROPOLITAN INSURANCE AND WORLD BUILDINGS. HOFFMAN HOUSE AND GRAND HOTEL. WEEHAWKEN ELEVATOR. BROOKLYN CITY R. R. POWER STATIONS. BROADWAY CABLE ROAD, and NEW SHIPS OF THE WHITE SQUADRON, U. S. NAVY.



Write for Catalogue to Nearest Office.

Robert A. Keasbey, 54 Warren St., New York. | S. C. Nightingale & Child, 134 Pearl St., Boston, Mass. | Keasbey & Mattison Co., Ambler, Pa.



WE ARE READY FOR 1894

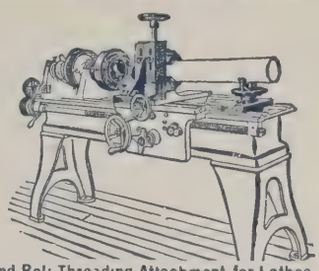
In all the departments of our factory, and we are prepared to turn out work at short notice. If you are considering the placing of a pipe threading or cutting machine in your shop, you had better get our prices and let us show you what you will get for your money. We manufacture

Forbes' Patent Die Stock, Pipe Cutting and Threading Machine for Hand or Power. Also Pipe and Bolt Threading Lathe Attachment.

SEND FOR ILLUSTRATED CATALOGUE.

CURTIS & CURTIS, 46 Garden Street, Bridgeport, Conn.

Portable Hand Machines we make enable one man to cut and thread 8 inch pipe.



The Curtis Pipe and Bolt Threading Attachment for Lathes

Our well-known, absolutely dry

RADIATOR BRONZES

and quick-drying

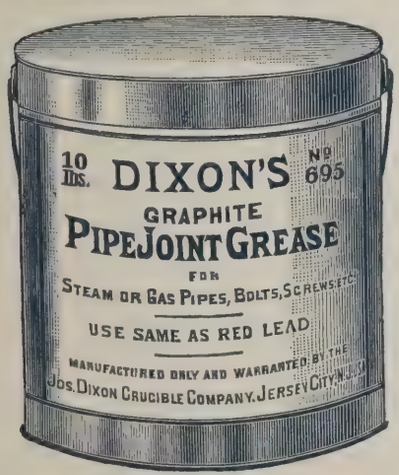
BRONZE LIQUID

are the most brilliant in the market.

Pale & Rich Gold, $1 00 lb Orange & Copper, $1.00 lb.
Silver, $1.25 lb. Bronze Liquid, $1.25 gall.

HEADQUARTERS for ALUMINUM BRONZE.

BERNHARD MEINERS,
49 Murray Street, NEW YORK.

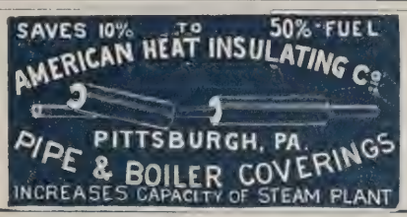


FAR BETTER AND CHEAPER THAN RED LEAD

Makes a tighter joint than red lead, that can be opened with perfect ease many years after.

Invaluable for all steam, gas and water piping, and equally useful for smearing gaskets on flange joints of meters, traps, and for bolts, screws, etc.

JOS. DIXON CRUCIBLE CO.,
JERSEY CITY, N. J.

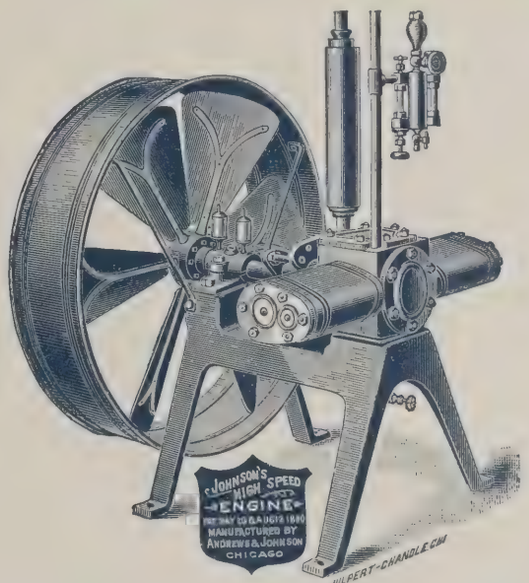


FRED. P. SMITH, C. E.
Consulting Engineer for the Ventilation of Buildings.
☞ Plans and specifications with skilled supervision and guaranteeing bonds furnished.
502 Exchange Bldg. BOSTON, MASS.

ANDREWS & JOHNSON CO.,
VENTILATING CONTRACTORS,

AND MANUFACTURERS OF

Exhaust Fans, Blowers and Fan and Engine Combinations;

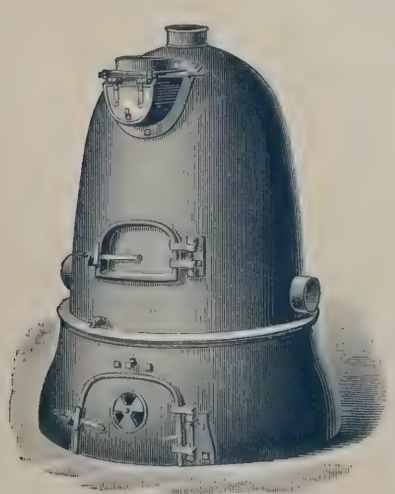


Are prepared to furnish Complete Outfits for Ventilating, Cooling, Drying and Heating.

Plans made and Estimates furnished.

Write for Catalogues containing Price List.

241-247 S. Jefferson St., CHICAGO, ILL.



THE WEATHERED HOT WATER HEATER,

MANUFACTURED BY

THOS. W. WEATHERED'S SONS,

244 CANAL STREET, - - NEW YORK.

ESTABLISHED 1859. INCORPORATED 1893.

For Heating Dwellings, Greenhouses, Churches, Public Buildings, &c.,

BY HOT WATER CIRCULATION ONLY.

OVER 6,000 IN USE.

Guaranteed to be more economical, quicker in circulation and more durable than any heater in the market. Hundreds are in use and doing good service that were put in 25 years ago. Send for our illustrated catalogue, "Health and Comfort in the Home Circle."

The Williams Furnace Co., capitalized at $100,000, has been incorporated at Muscatine, Ia., for the manufacture of patented furnaces.

The Lewis Boiler Co., of Boston, have received a contract for steam heating Shepherd Memorial Church, Cambridge, and will use Exeter Ornamental radiators.

The Syracuse Stove Works have completed inventory and closed the books for 1893, and it is gratifying to note that their business for the year even better than in 1892.

The Mulford Heater Co., Galva, Ill., have closed their Chicago office, and E. E. Emerson, their former manager, has gone into business for himself on the west side.

The Michigan Bryce Furnace Co., Grand Rapids, Mich., have filed articles of incorporation. The new company is capitalized at $30,500, and will make and sell furnaces

Geo. B. Cobb will not remove from New York, as has been erroneously reported, but will be found at the old stand, 42 Duane street, New York, prepared to do business as heretofore.

John B. Hughes has succeeded the old firm called the St. Louis Heating & Ventilating Co., St. Louis, Mo., and will do all kinds of steam and hot water heating and pipe fitting in all of its branches.

McMann & Taylor, 42 Cliff street, New York, dealers in steam fittings, plumbers' supplies, etc., have been made agents for this territory of the Eddy Valve Company. They will carry their goods in stock.

W. G. Lownsbury, the well known hot air expert, who has been connected with the manufacture of furnaces for twenty years, is now in active charge as superintendent of the Carton Furnace Co., Utica, N. Y.

Munson & Spinner, of Herkimer, N. Y., through C. A. Lounsbury, heating engineer, have completed the steam plant for the Briggs House (350 rooms), Old Forge, Adirondacks, N. Y., using tubular boilers.

The Superior Furnace Co., of Little Falls, N. Y., under the management of W. H. Switzer, have grown and prospered so that plans are all ready for a new factory which, it is hoped, will be ready early this summer. The past year has been a very satisfactory one.

The Harell Steam Heating Co., of Dunkirk, N. Y., will run their plant continuously during 1894, their intentions being to have a large stock on hand when the active season opens, and give their customers prompt attention. Their 1893 stock was completely sold out.

Edward P. Bates, Syracuse, N. Y., has closed his Chicago office which proved unremunerative. Mr. Bates will continue in the steam and hot water business, with principal office at Syracuse, N. Y., where he will be pleased to correspond with former customers and to reply to new inquiries.

We have received from the secretary the official hand book of the Master Steam and Hot Water Fitters' Association of the United States, 5th Annual Convention Souvenir, Chicago, 1893. The book is finely printed and beautifully illustrated, and contains the full report of the proceedings. Thanks, Mr. Secretary.

C. F. Bachler of the Philadelphia office of the Monitor Steam Generator Mfg. Company, Landisville, Pa., reports that the trade in the steam and hot water boilers has been so satisfactory during the past year that steps are being taken to double the producing capacity of their plant in time for this year's business.

Jenkins Brothers, manufacturers of Jenkins valves and standard packing, have removed their Philadelphia branch from its former quarters at 21 North Fifth street to 117 North Fourth street. They are preparing to furnish standard flanges as provided for by the resolution of the National Association of Steam and Hot Water Fitters.

The new plant of the Buffalo Heating & Ventilating Co. at Homewood, a suburb of Buffalo, is of brick. The molding room is 120 by 305 feet. The machine shop is 50 by 180 feet. Then there are the finishing rooms, boiler and engine rooms. In the spring a further addition 250 by 180 feet will be added as office buildings. The company will manufacture furnaces, dry closets, etc.

The Pittsburgh (Pa.) Heating Supply Co., 100 Water street, have closed contracts for the following jobs: Western Pennsylvania Blind Institute of Pittsburgh, indirect steam heating; C. P. Mayer, Bridgeville, Pa., storerooms and city hall, hot water heating; Messrs. Falk & O'Neal, Steubenville, O., storerooms, apartments, and assembly hall, steam heating; A. J. Mercer, Wilkins avenue, city residence, hot water heating.

Messrs. Fuller, & Warren Co., of Troy, N. Y., are making their new furnace in twenty different sizes, nine of which sizes are made with the horse shoe radiator, six sizes with steel dome and revertible flue, and five sizes made for burning wood. The fire pots are made in sizes from 16 to 35 inches, casing rings 28 to 65 inches. A particular advantage is a patented device for bolting the casing rings together, making the whole very solid and rigid.

The New York Central Iron Works have reached the 10,000 limit for boilers sold. General Manager Squires says they have work ahead for six weeks or more, and from personal inspection of their works the writer found their stock of boilers on hand very low. Twelve Dunnings went to the Government barracks, Fort Crook, Neb., a few days since, the steam heating being done by J. L. Welshaus & Co., Omaha, Neb. The latest report from Mr. W. B. Dunning is that he is somewhat better.

The Thatcher Furnace Co., of 33 Peck slip, New York city, and with foundry at Newark, N. J., report an increasing demand for their specialties, and state that the business of the past year was far ahead of any corresponding period in their history. This is particularly gratifying, considering the many complaints of hard times and the general business depression existing in all sections of the country. The company have just brought out and put on the market a handsome double oven range, which is made in portable form and for brick setting.

EST. 1857.



YOUR STOCK

is not complete unless you carry a line of

WILKS WATER HEATERS, TANKS AND STEAM GENERATORS.

For all purposes for which Hot Water or Steam is required.

Oldest Manufacturers. *Best Goods.* *Prices Right.*

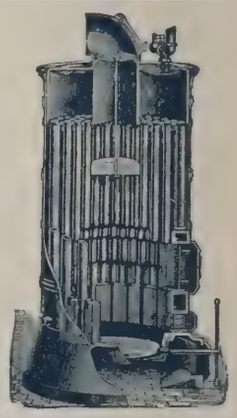
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S. WILKS MFG. CO.,

Mention H. & V. 113 to 123 Clinton Street, Chicago, Ill.

A Package of Satisfaction

goes with every one of our Heaters. It's in the fire-box of every boiler. You can't see it, may be, but it's there. The man who uses the boiler will find it.



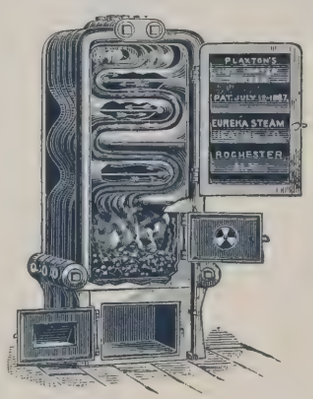
"EQUATOR" STEAM BOILER. "GULF STREAM" HOT WATER BOILER.

The construction is such that the greatest possible boiler surface is exposed to the direct radiation of the fire. The drop tube system is used and the ratio of fire surface to grate area is nearly 40 to 1. These boilers are both easily and quickly set up—more so than any others. That is a feature worth considering. We'd like to send you our book.

A treatise on the selection of a House Heating Boiler sent free to any address upon application, also a book of Estimate Blanks issued for use of contractors in keeping a complete record of each plant installed, and specifications for steam or water apparatus

NASON MANUFACTURING CO.,

71 BEEKMAN STREET, - - NEW YORK.



PLAXTON HOT WATER HEATER

Excels all other Heaters in respect to

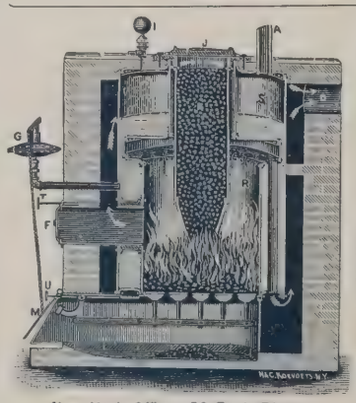
SIMPLICITY OF CONSTRUCTION.
ECONOMY OF FUEL.
EASE OF LEANING.

The Cheapest Heater on the market when results are considered.

SEND FOR CATALOGUE TO

THE EUREKA STEAM HEATING CO.,

ROCHESTER, N. Y.



New York Office, 36 Park Place.

HAD

LILIUOKALANI *

Used the "Dunning" she would not now be "Out in the Cold."

19,000 in practical use

shows the great popularity of these heaters. Made for Steam or Hot Water. 40 years' experience. A catalogue for the asking.

New York Central Iron Works Co.,

298 Exchange St., GENEVA, N. Y.



G. & J. R. Bolton Heater

FOR HOT WATER.

All of Messrs. Bolton's Latest Improvements

MANUFACTURED BY

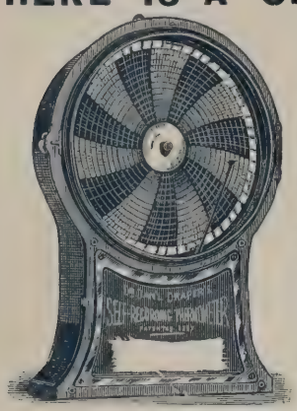
THE FOSKETT & BISHOP CO.

New Haven, Conn.

NEW YORK OFFICE, 114 Liberty St.

Send for Catalogues and Drawings,

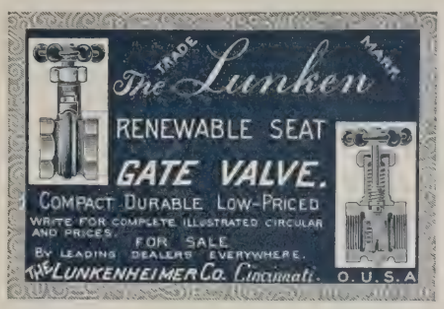
HERE IS A CHANCE!



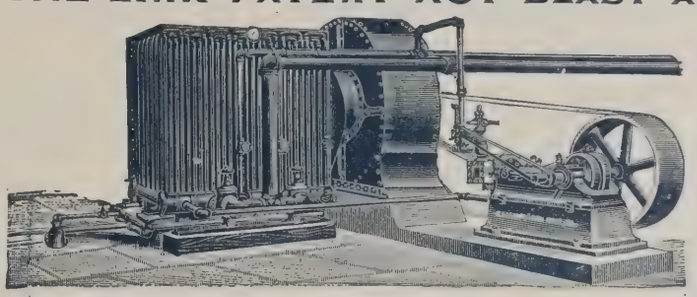
Draper's Self Recording Thermometer.

This instrument gives a continuous record of the temperature, day and night, for a week. It is an invaluable accessory in dwellings, hotels, hospitals, asylums, schools, ***Dry Kilns,*** and other places where temperature is of consideration. For particulars address

DRAPER MFG. CO.,
152 Front Street New York.



THE LINK PATENT HOT BLAST APPARATUS.



We take pleasure in calling your attention to the accompanying illustration showing our

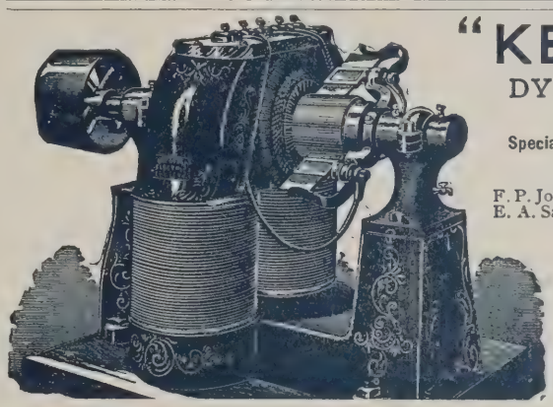
Patent Hot Blast Apparatus,

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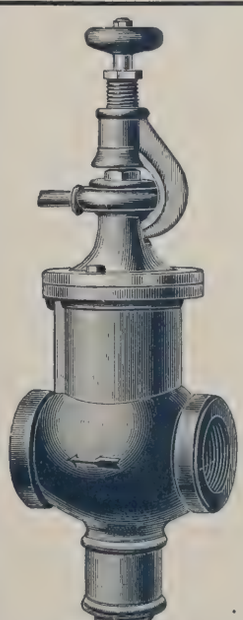


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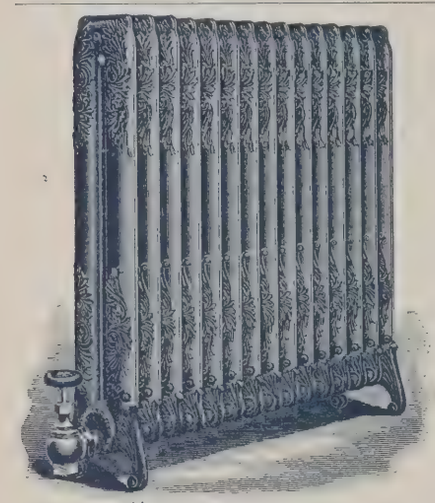
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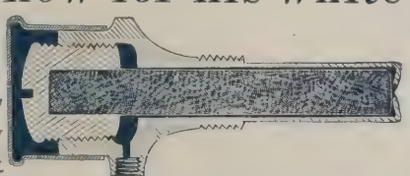
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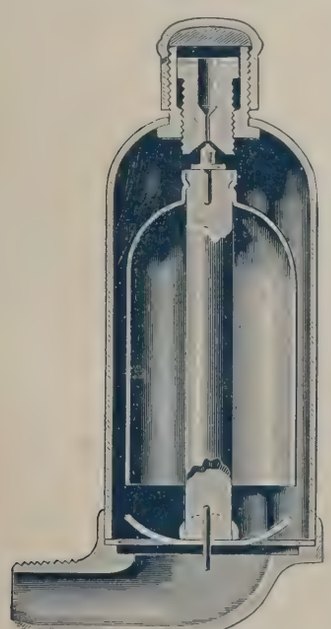
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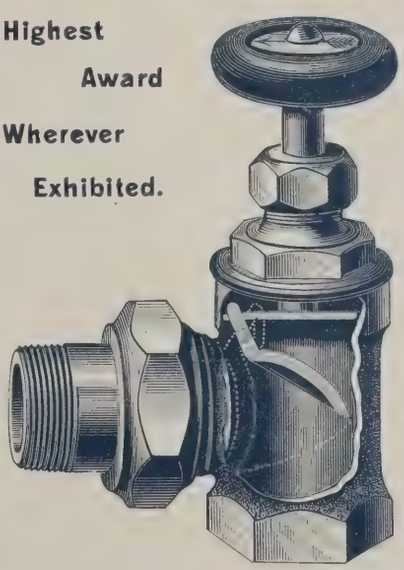
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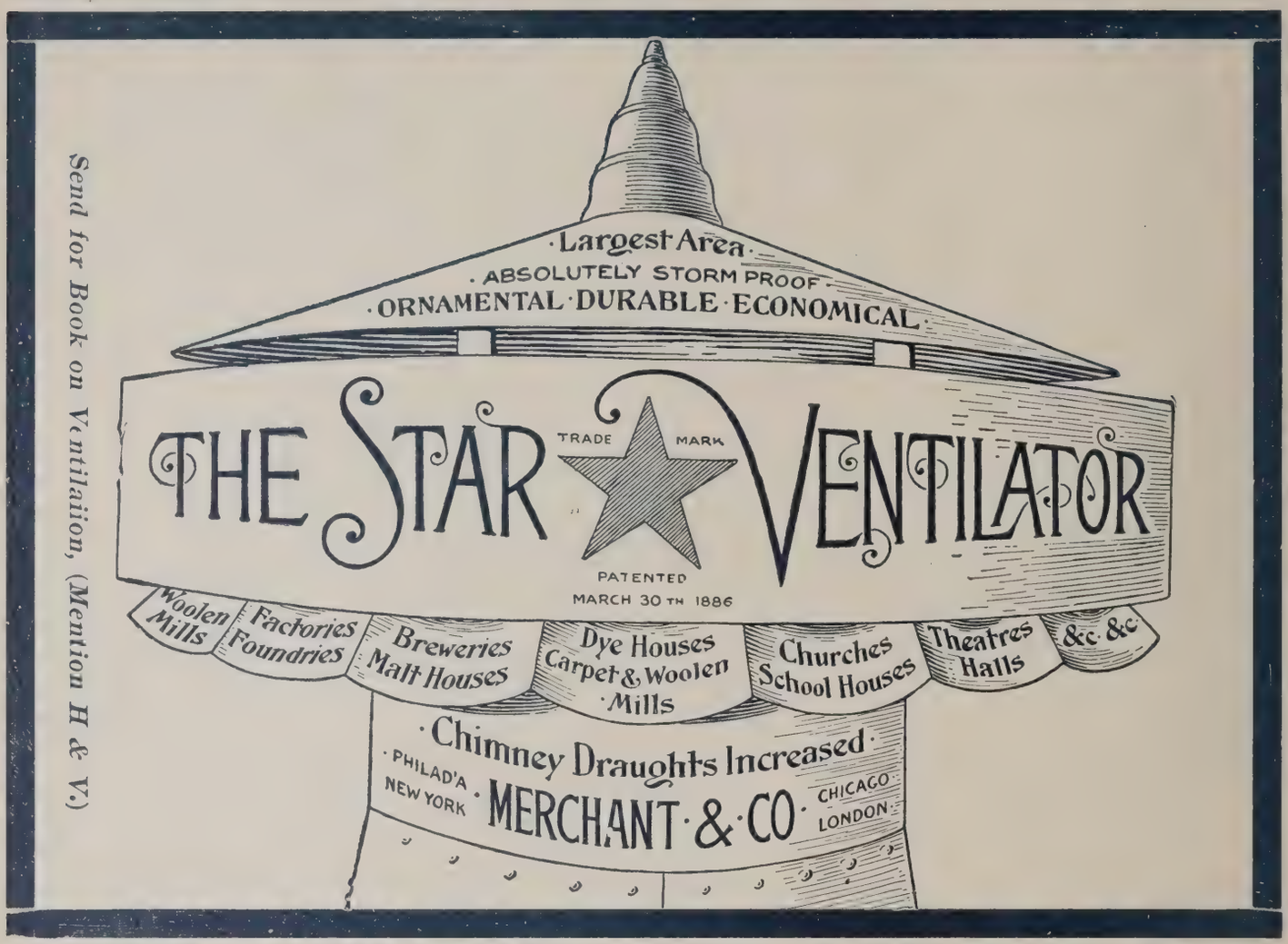
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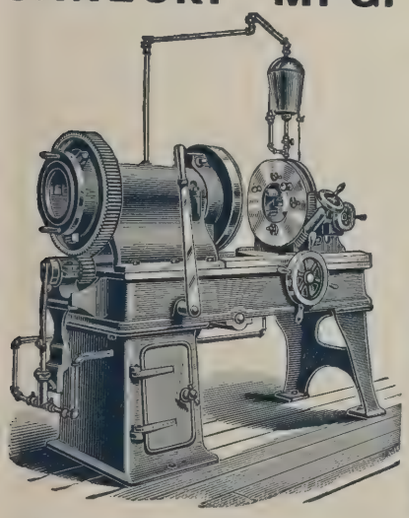
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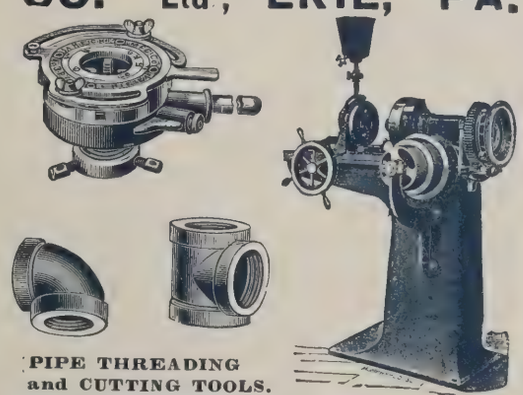
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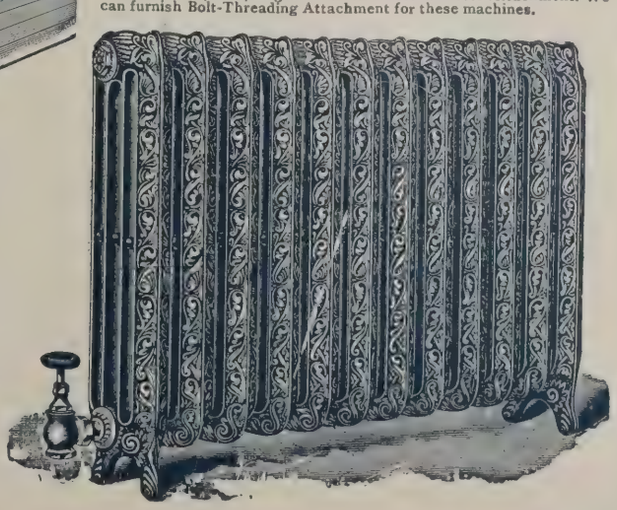
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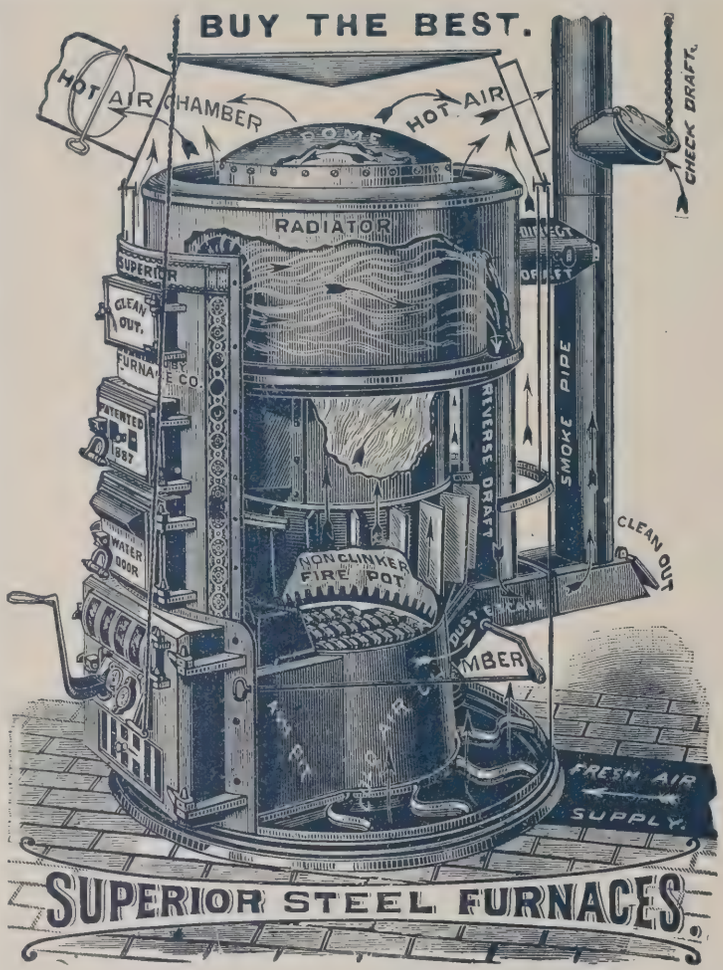
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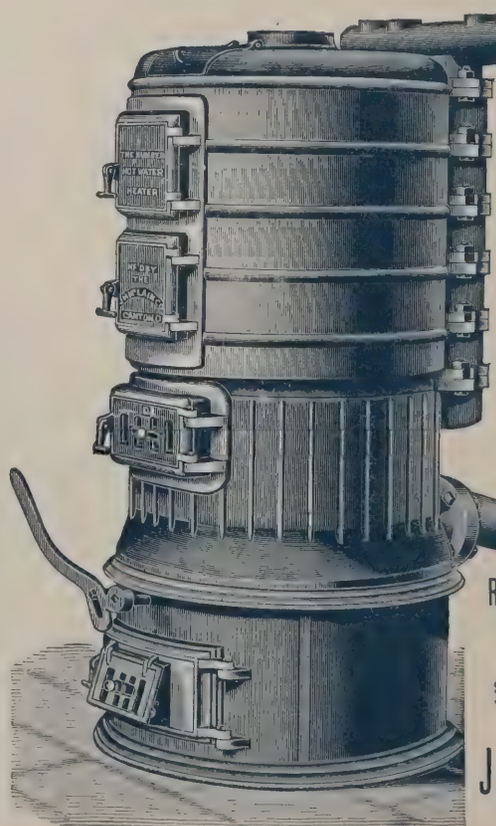
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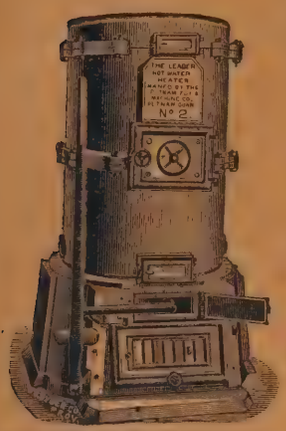
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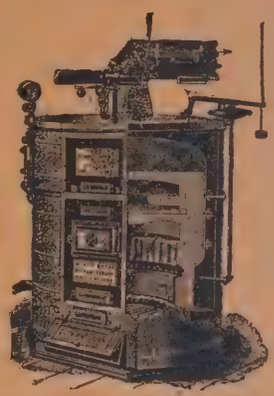
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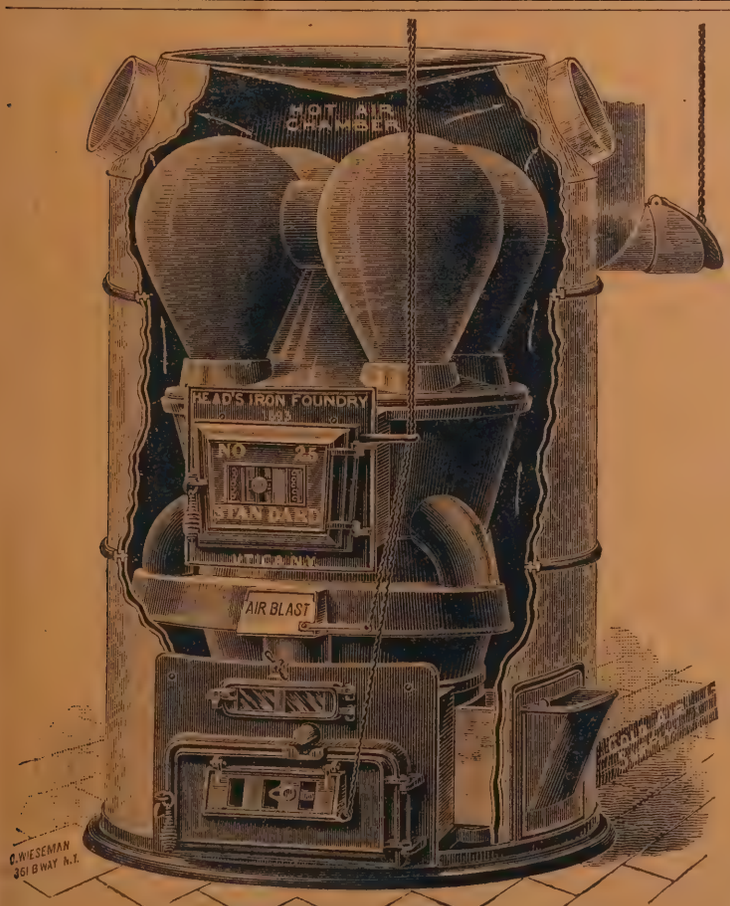
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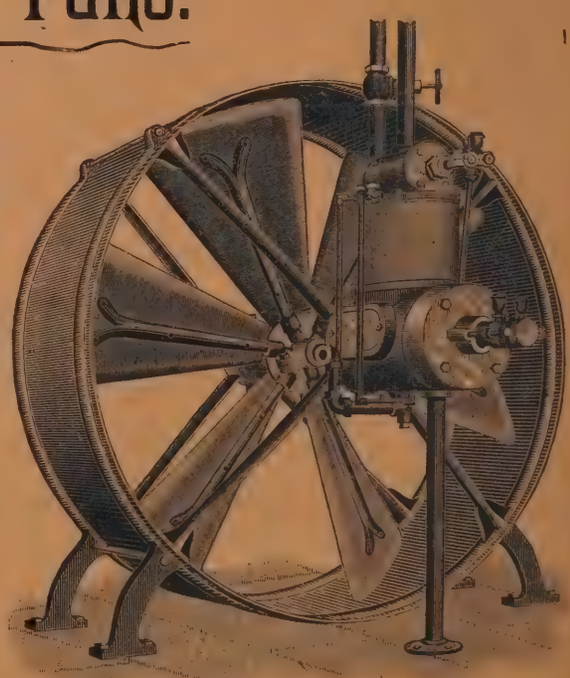


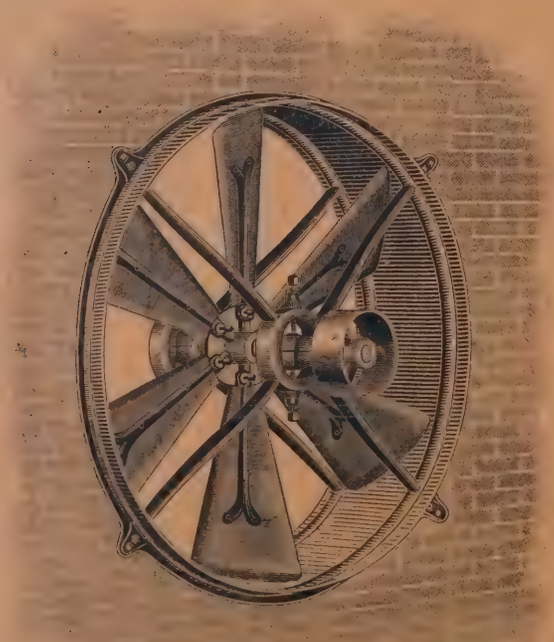
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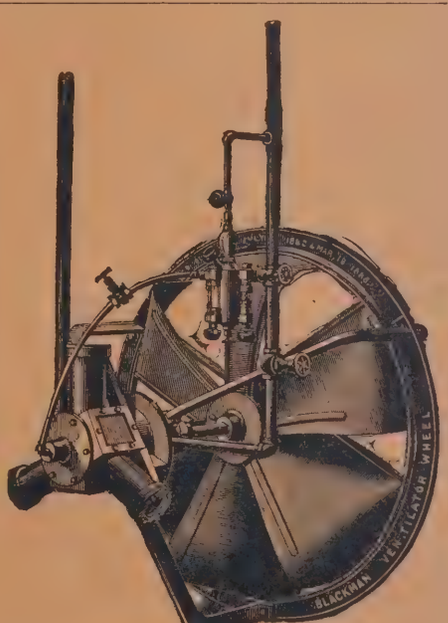
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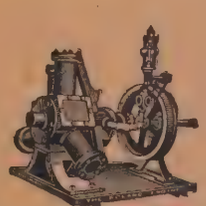
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The Blackman. (Diagonal View.)



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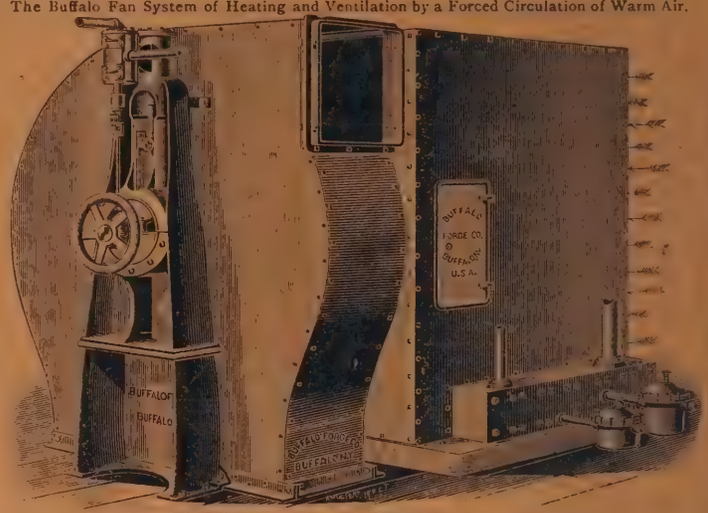
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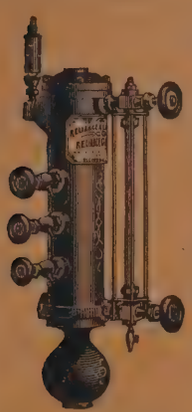
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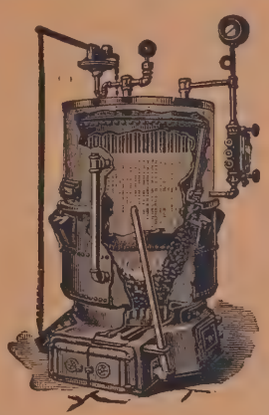
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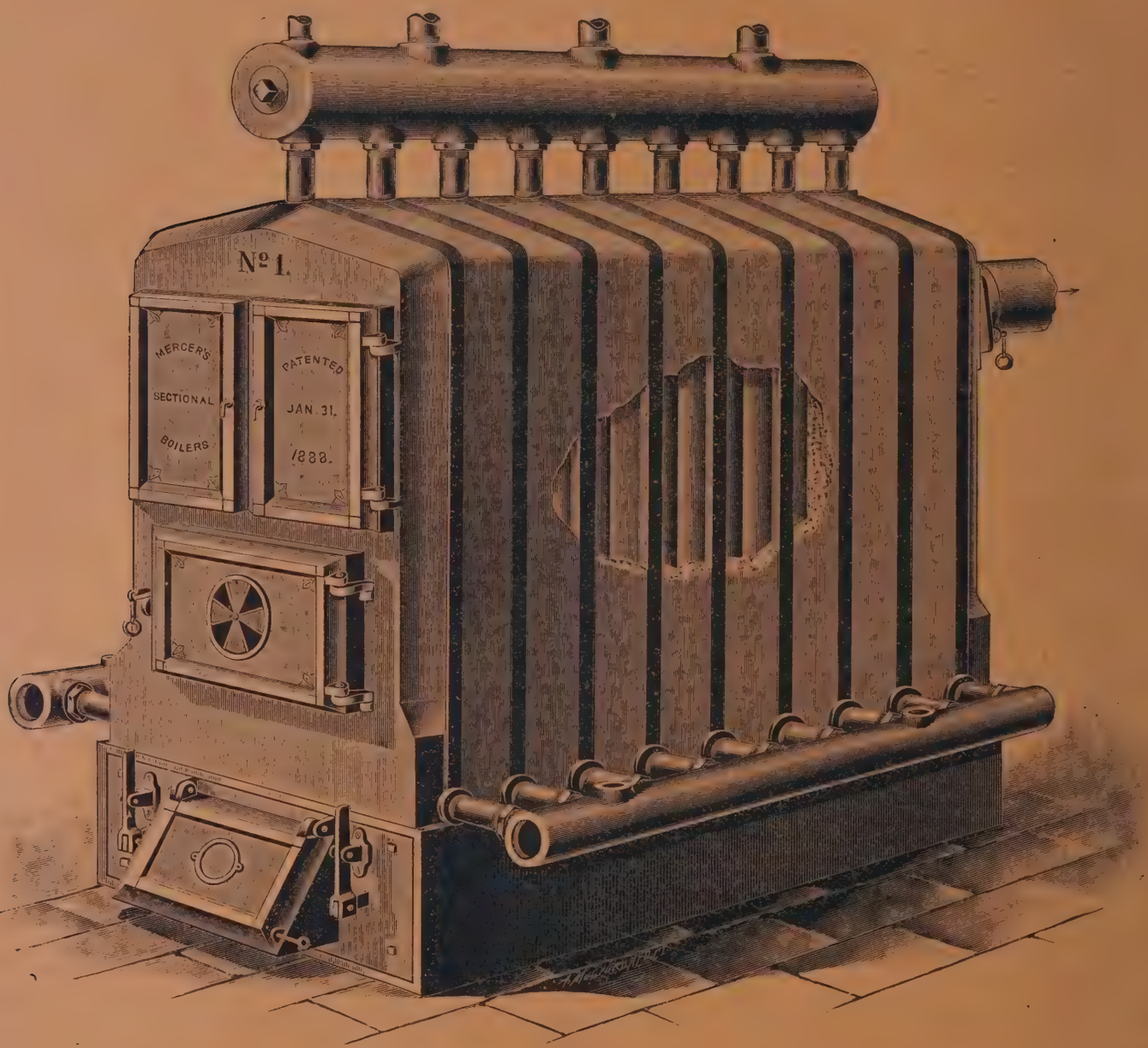
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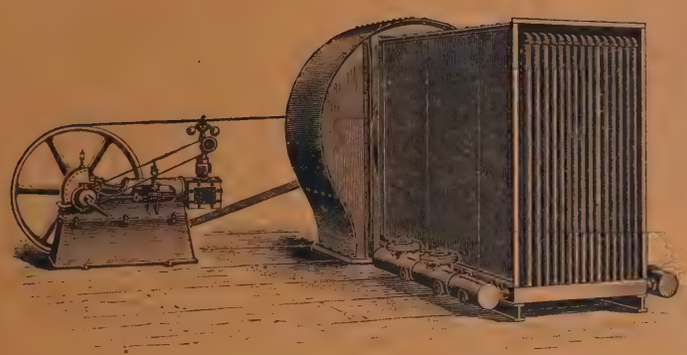
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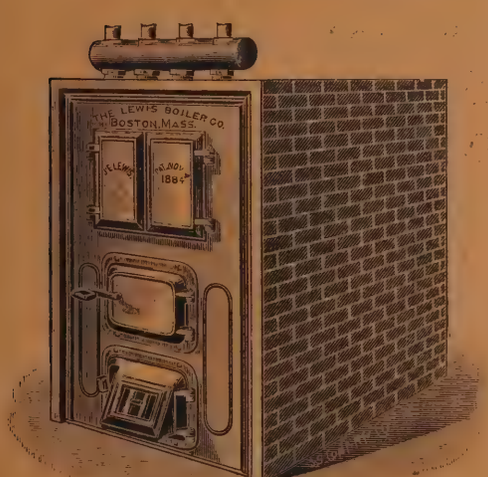
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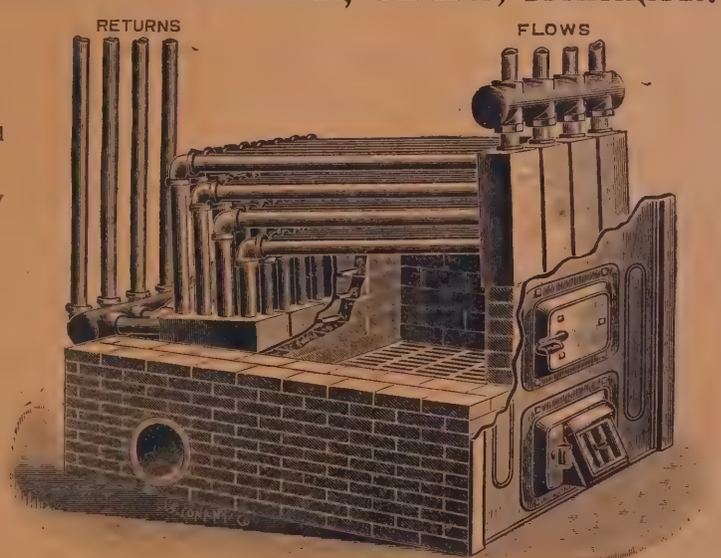
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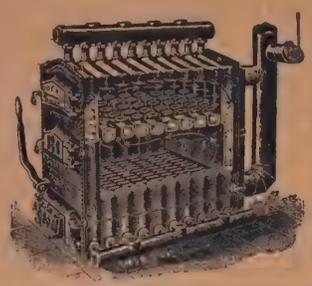


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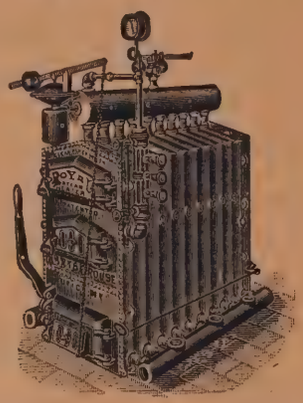
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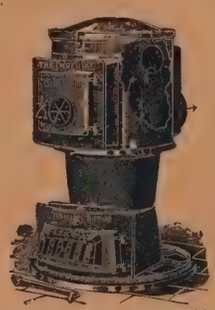
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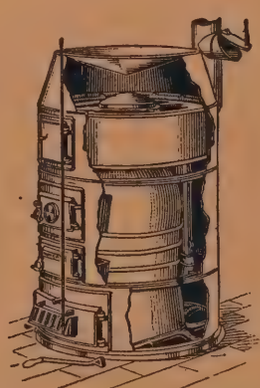


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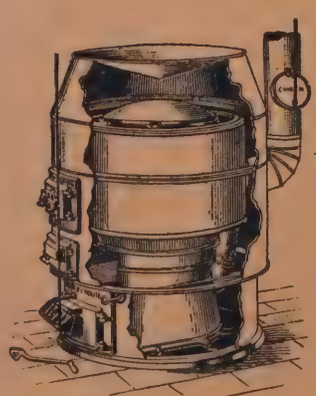
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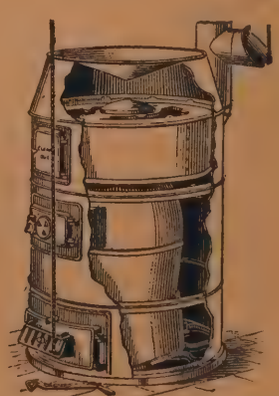
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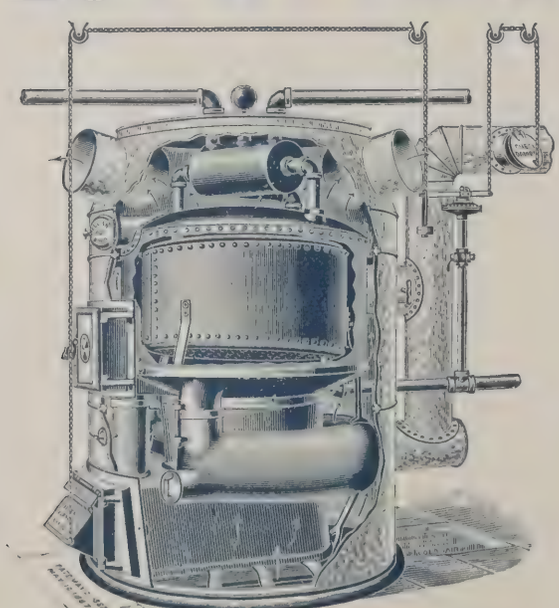
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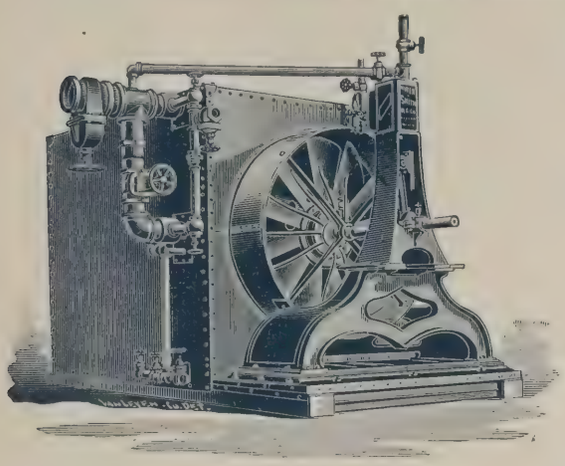
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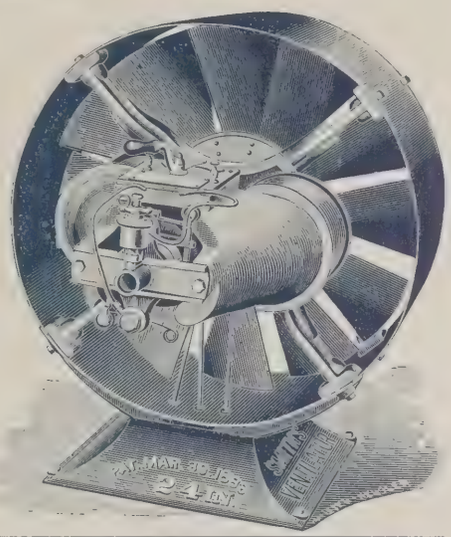
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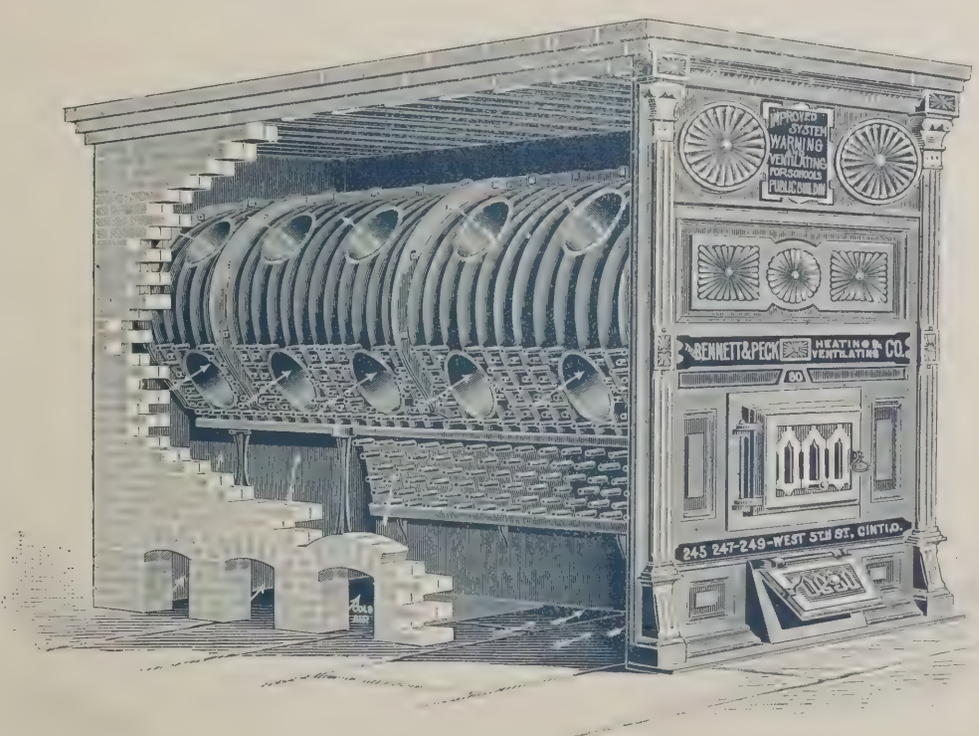
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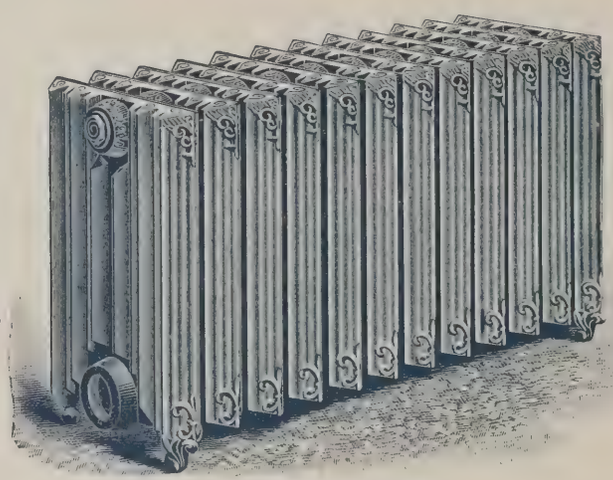
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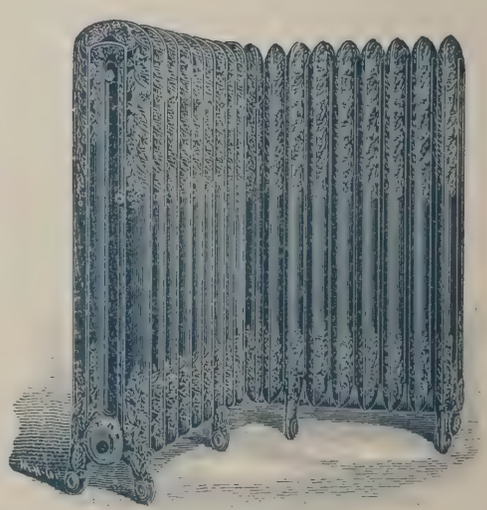
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Heating and Ventilation

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The Detroit Central High School.

One of the largest and finest high school buildings in the country, in which special attention has been given to light, sanitation, heating, and ventilation, is now being built at Detroit, Mich., from the designs of Messrs. Malcomson & Higginbotham, architects. This firm has had a large experience in school house work, and the results of their experience and careful study have been so combined in this building as to produce a structure convenient in arrangement and complete in its appointments. The exterior, though plain, is very imposing. The treatment throughout is artistic, yet quiet and withal inexpensive.

It is said that after the architects had prepared preliminary sketches of the building, the board of education invited bids for the heating and ventilation. This was done so that the system adopted could be incorporated in the working drawings. When the committee assembled to open the bids, they were confronted with elaborate plans, specifications, and estimates from six different concerns. As the contract was so large and of such vast importance, the Board decided, on the recommendation of the committee, to employ a capable engineer to select the best plant from those submitted, as they felt incompetent to perform the task.

Mr. W. J. Baldwin, M.E., of New York, was employed, who recommended the plant proposed by the Huyett & Smith Mfg. Co., of Detroit, Mich. This led to a long, hard fight, as some members of the board hesitated about giving the contract to this company, in view of the fact that one of the competitors, besides being a well-known concern, was nearly $4,000 lower, but after the expiration of nearly three months the contract was awarded, by a unanimous vote, in accordance with Mr. Baldwin's recommendations.

The building is 275 feet across the front and 220 feet deep; it is three stories high and, contains about 1,650,000 cubic feet of space. The requirements stipulated in the invitation for bids were that each pupil in all grade and recitation rooms be supplied with 2,000 cubic feet of fresh air per hour. As these rooms will have a seating capacity of about 3,000 pupils, 6,000,000 cubic feet per hour must be admitted to these rooms alone. In addition to this amount 789,000 cubic feet must be delivered per hour to the cloak and toilet rooms, and 692,000 cubic feet to the halls; the air delivered to the former being equal to a change of air every fifteen minutes and to the latter every twenty minutes. Thus it is seen that 7,481,000 cubic feet of air per hour must be handled, which is accomplished by three large steel plate blowers located in the basement, as shown in Fig. 1. Two of these blowers discharge directly into a large brick duct beneath the basement floor, as shown by Fig. 10. This duct runs to the middle of the main corridor, which extends the entire length of the front portion of the building. At the end of the duct, supported by iron columns and I beams, are two banks of steam coils inclosed by steel casings, insulated



THE DETROIT CENTRAL HIGH SCHOOL, DETROIT, MICH.

with asbestos blocks bolted to the inside of the casing, as shown in Fig. 7.

The conduits are of galvanized iron and consist of two systems, one beneath the other, as shown in Figs. 5, 7, 11, and 12. The upper conduit conveys warm air, the lower, cold air. The coils have a passage under them which allows the cold air to enter the lower conduit without becoming heated, as is shown in Fig. 7.

Each room is provided with regulating devices so that the temperature of any room can be regulated without affecting any other room and without shutting off the supply of fresh air, as shown in Fig. 11.

The third blower, Fig. 6, is attached to another bank of coils, operating on the rear portion of the building, and is designed for a cold air passage, the same as are the heaters in the front part of the building, and the fresh air is distributed and controlled in the same manner.

On the third floor of the rear portion of the building is an auditorium, shown in Fig. 4, which will seat 1,500 people. It is not expected that this room will have to be heated and ventilated at the same time that the rest of this portion of the building is occupied; thus the plant is so designed that all the air can be thrown into the auditorium when desired.

The blowers are driven by two 50 horse-power automatic engines, which are belted to a countershaft supported by pillow blocks on brick piers with capstones.

Four standard tubular boilers are located in a boiler house on the extreme rear right hand corner of the property, as shown in Fig. 1, to furnish steam for power and heat, which is brought into the building in pipes run in a large brick tunnel below the surface of the ground.

All the exhaust steam from the engines and pumps will be used for heating. The water of condensation will be run through a grease extractor and into a receiving tank, from which it will be automatically returned to the boilers by a duplex pump. The steam pressure to the coils will be reduced by pressure reducing valves on the live steam mains.

The engines to be used in this plant are extra large, so that they may do their work without straining them; and, further, in case of accident to one of them, the other can do the work, by increasing the steam pressure, until repairs are made.

The velocity of the air in the main conduits will be about 15 feet per second, in the vertical flues 10 feet per second, and into the rooms 7 feet per second.

The fresh air inlets to the various rooms will be about eight feet above the floor, and will be covered with bronzed wire, as is shown by Figs. 5 and 11. The vents will be open, the floor of the room running to the back of the flue, the interior plastered, and the jambs cased the same as the doors or windows.

To the sanitaries has been given great study, and they will be very complete in every detail. The toilet rooms have no connection with any rooms or halls, and can be entered only through the cloak rooms.

Fresh air is admitted to each cloak room at the end farthest from the door into the toilet room, and the vent flues in each instance are likewise placed as far from the door to the toilet rooms as possible. The bottom panels of the doors between these rooms will be fitted with screens or grilles.

It is manifest that air being admitted at one end of the cloak rooms and taken out at the extreme end of the toilet rooms, a thorough circulation will be maintained through both rooms, and always toward the latter. Each of the vent flues in the toilet rooms will be provided with a siphon to create a partial vacuum in these rooms. It is evident that with such provisions the foul air from the toilet rooms can find no means of escape into the other parts of the building.

The closets will be porcelain, of the latest approved designs, and the plumbing system throughout will be that known as the Durham system. No wood work of any description, excepting the seats, will be employed in the finish of the toilet rooms.

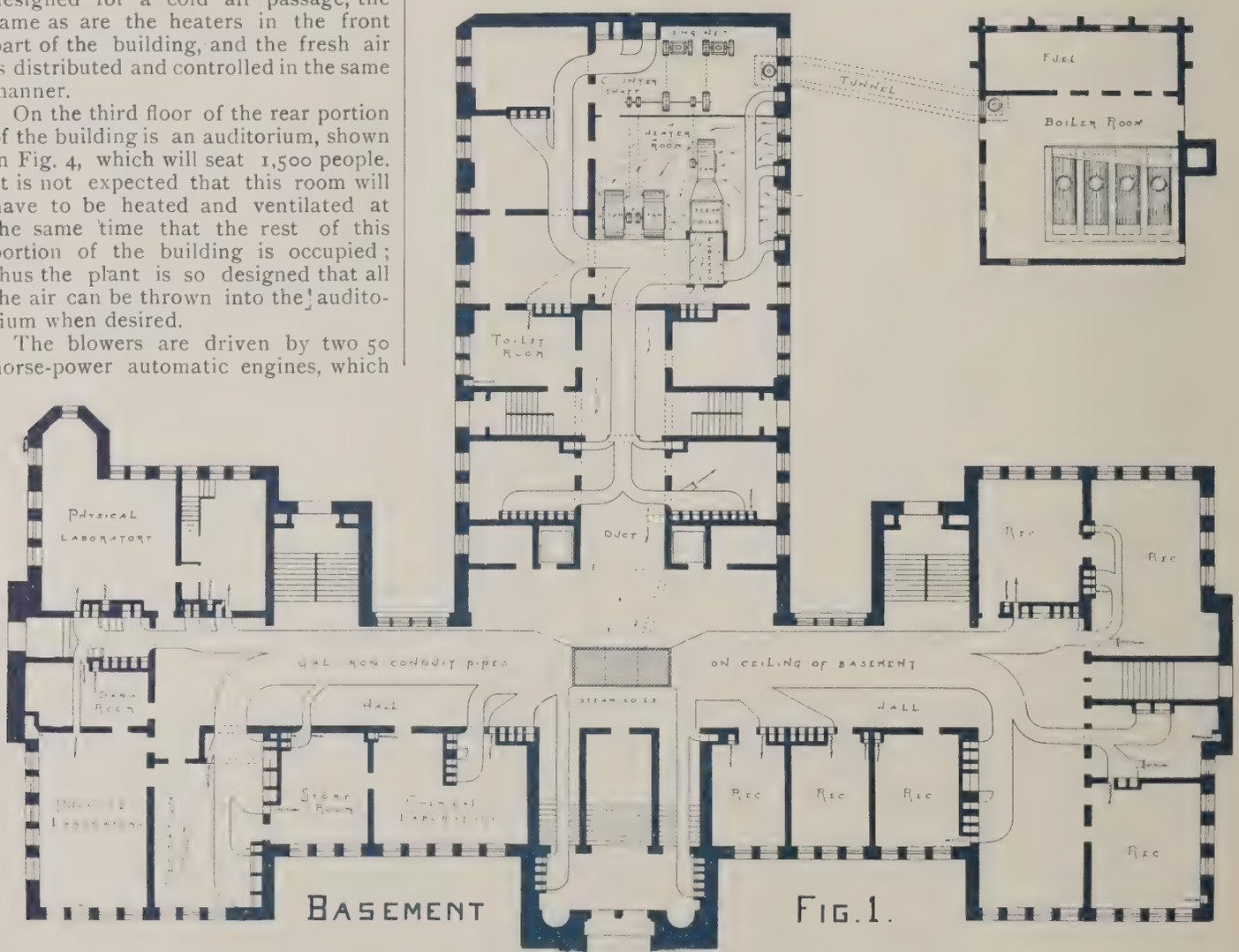


Fig. 1.

HEATING AND VENTILATION OF THE DETROIT CENTRAL HIGH SCHOOL, DETROIT, MICH.

This building adds one more to the long list of fine public buildings heated and ventilated by the Huyett & Smith Mfg. Co.'s apparatus.

Gas Heating in German Hotels.

The relative advantages of heating by coal stoves, air, steam, water, and gas for large hotel dining rooms and the like are thus discussed in the *Hotelkeepers' Journal*, with special reference to hotels in Germany. The desiderata are stated to be that the first cost and the current cost must be low; that the service must be simple, so that guests may not be disturbed; that the room may be quickly

warmed up on short notice; easy regulation and prompt extinction when not wanted, as, for instance, when a ball follows a concert; and that even though the fire may have been out for several days there shall be no danger from frost.

Ordinary stove heating is cheap in putting up, but the stoking disturbs the guests, unless it can be done from outside. Stoves take up too much room if sufficiently powerful; with iron stoves the heating is quick, but is not easy to regulate; overheating can scarcely be prevented, and fuel is wasted when the hall is only to be used for a short time; and so the current cost is not small under the usual conditions, where the hall is only used for from two to five hours at a time, there being seldom less, and usually more than two hundred pounds of coal employed on each occasion.

After this discussion, some instances of actual costs are given. At the Hotel Hirsh, in Limbach, there was a hall, with annexes, of altogether about 180,000 cubic feet space, in a very cold and exposed situation, open to the wind on three sides, with light roof, and two doors opening to the outer air. Stoves were used, but the hall was a cold one. Low pressure steam fittings would have cost $875; but the Limbach Gas Company offered to put in four Schaffer & Walcker's (of Berlin) patent double regenerative gas stoves for $450, and connections, etc., for $50. This was done. In December, when the hall was in use almost every evening, the consumption of gas was 38,100 cubic feet. In a case of extreme cold when the gas had not been lit for three days, it was lit at 6 P.M. for an entertainment at 8 P.M. The temperature outside was 5°F.; that inside was 23° F. At 8 P.M. these temperatures were 5° F. and 50° F., while 1,500 cubic feet of gas had been used. At 10 P.M. the temperatures were 5° F. and 60° F., while 1,236 cubic feet had been used during the two hours; and at 12 P.M. the external temperature was — 2.2° F. and the internal 66.2° F., while 706 cubic feet of gas had been used during these last two hours. The total gas used was thus just over 3,500 cubic feet; and a hall in a less exposed position would have required less. This is considered "distinctly cheap and convenient." The flat cast iron apparatus stands up against the wall, and is considered to be an ornament to the room. In another place, the Casino Hall at Bochholt, 70,000 cubic feet capacity, four gas chimney apparatus by Schaffer & Walcker were put up; cost, $225; average results during January, 1893, external temperature, 5° F.; internal, 27° F. before lighting the gas; 66.2° F. in two hours; gas used, 565 cubic feet for the first two hours, and from 70 to 105 cubic feet per hour thereafter.

Heating such apartments of large size from a central stove, either by water, air, or steam, for short periods at a time, does not work well; the cost of fittings is pretty heavy. These methods are best adapted for continuous heating, and this, if kept up, would be wasteful, while intermittent variations call for special skill and attention. Hot air is not easy to regulate, though steam and hot water act satisfactorily in this respect; ordinary water heating not so well; and shutting off the heat can be done with air or with steam pipes fitted with radiators, while ordinary water or steam pipes go on radiating for a good while after the water or steam is shut off, the result being very disagreeable when the room is already too warm. These central-stove methods require a long preliminary heating up; and this causes a considerable waste when the hall is used only for a short time; and also the fittings require adaptations in the mason work, except for hot air. In high winds air does not work uniformly, and in time of frost, steam and water pipes are apt to freeze when not used, unless there is some heating (otherwise wasteful and useless), kept up to prevent this.

The newer improved gas stoves have shown that in their use there is no carrying fuel and ashes about, that the fire can be lit at once on merely opening a stop cock, that the kindling is of the simplest possible kind—merely a match or an electric spark—that the full power can be put on at once, that the heat can be exactly and promptly regulated or instantly shut off without any loss of fuel, all these qualities being excellently adapted to the object in view; and that the heating apparatus can be readily connected with the gas supply, and in many instances readily shifted about the hall; that there is no dust; that no attention is required to keep the affair going, and the room is heated up in the shortest time, while with very simple arrangements for taking away the products of combustion there is no smell or smoke. At the same time, for such purposes as those in view, the current cost is often lower, and never higher, than that of other fuels. Gas heating is, therefore, according to the paper quoted, preferable for such purposes to any other. The cost of apparatus is about $75 to $100 per 35,000 cubic feet of room space, and the hourly consumption of gas about 35 cubic feet in the severest winter cold.

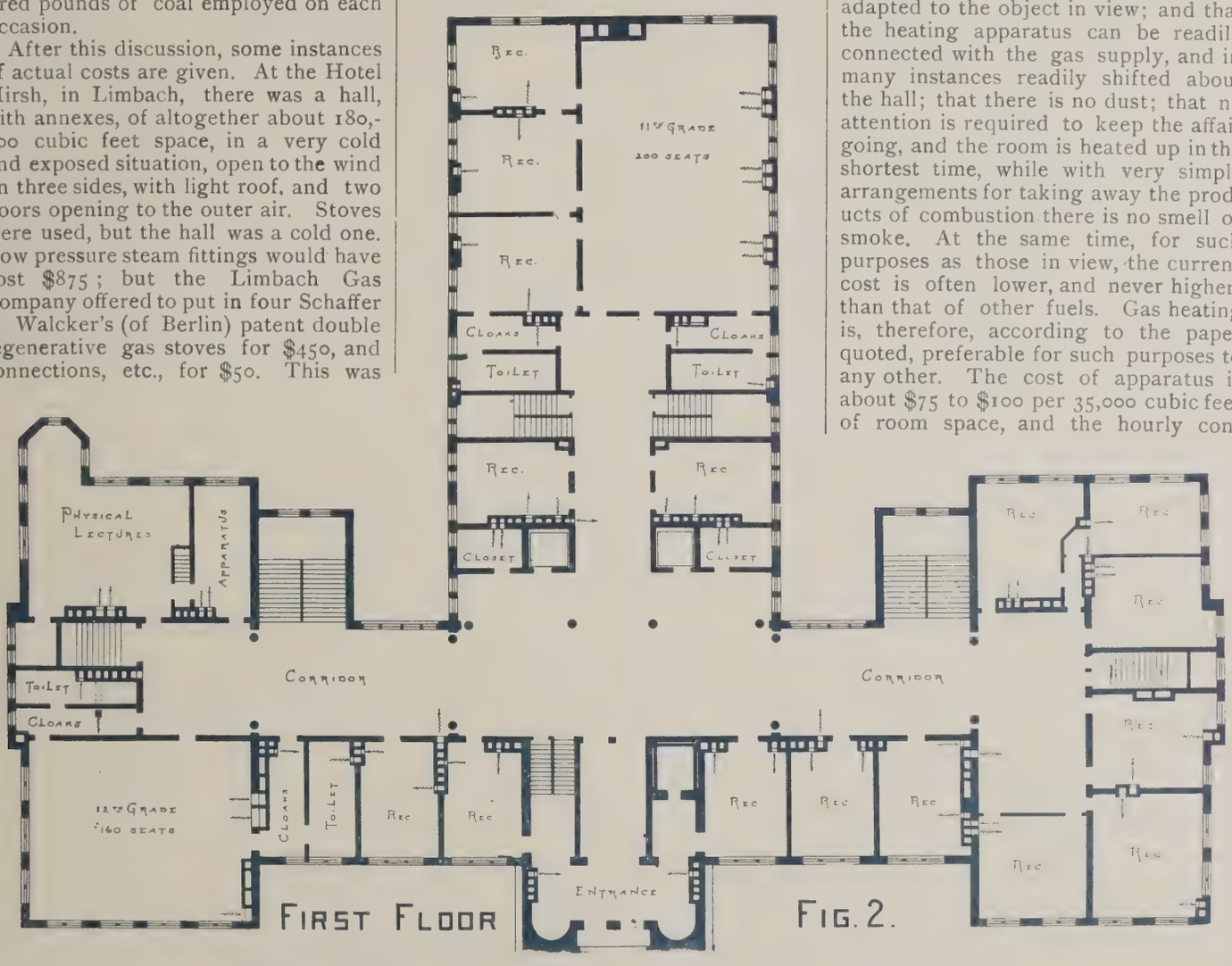


FIG. 2.

HEATING AND VENTILATION OF THE DETROIT HIGH SCHOOL, DETROIT, MICH.

Most of us live and work and sleep, says an English exchange, in stuffy, fussy, badly ventilated rooms, which is one of the chief causes of all the illness that exists and of all the deaths that take place. Especially in the houses of the artisan class, the space allowed for each person is often less than a quarter of what is needed for health; and it is important to remember that, whatever the size of the room, there should be an opening for fresh air and another for foul air each having an area of at least 24 square inches for every person in the room.

Ventilation and Heating.*

A very large proportion of schools are so poorly provided with ventilating arrangements that they are practically dependent on open windows. To relieve this unfortunate state of things, the lower sash may be raised two inches (less in stormy weather) and a board placed in front to deflect the air upward. The upper sash (which ought always to be movable) may be lowered an inch. These measures are attended with little risk, and give perceptible though partial relief.

Perforations in the sash, window pane, or wall also give some relief. Such methods may provide sufficient air for five or six persons in a room, but are entirely inadequate for the supply of a whole class. The attempt to ventilate school rooms in cold weather by the windows in the northern United States is either very dangerous to health or very ineffective, or both. The amount which can safely be admitted in this way may be one-fifth to one-tenth of what is needed. The existence of ventilating flues or openings does not of itself insure good ventilation. Flues may be too small, or crooked, or partly or wholly stopped up; they may discharge into other rooms or the attic instead of the outer air; they may be without means for causing the air to rise in them; they may be in many ways badly planned.

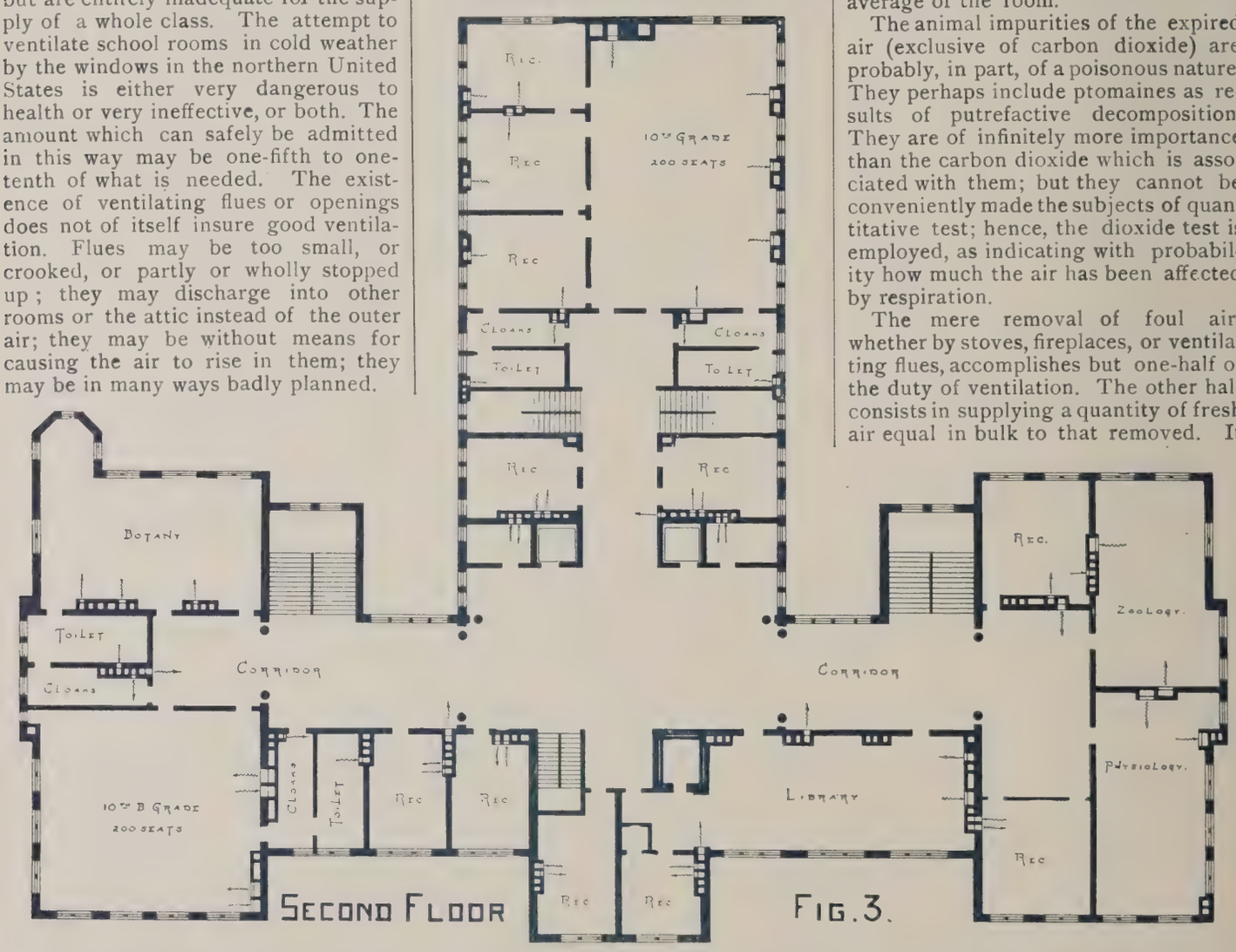


Fig. 3.

HEATING AND VENTILATION OF THE DETROIT CENTRAL HIGH SCHOOL, DETROIT, MICH.

It ought to be understood by everyone concerned in ventilation that large collections of persons require very large amounts of air; that the amount should be calculated, and the size of the flues determined before the house is planned; that true economy requires us to consider the system of heating and that of ventilation as interdependent parts of one and the same problem; and that both should form a part of the original architectural design.

The amount of fresh air to be brought into the building for each pupil should be 2,000 cubic feet per hour for younger children (under ten) and 3,000 for high-school pupils. These amounts are calculated from the assumptions that the external pure air contains an average of four parts of carbon dioxide in 10,000; and that when the dioxide has increased under the influence of respiration to the amount of more than six in 10,000, the air may be considered impure. Dilution to the extent mentioned above will keep the air of the room below the point of impurity here assumed. The purity required by this standard is such that persons coming fresh from out of doors will not perceive any distinct closeness in the air of the school room.

As regards the relative requirements at different ages, it may be assumed as proportionate to the different amounts of carbon dioxide exhaled by people of different ages. In the case of children of eight years it is about two-thirds as much as in young persons of fifteen.

If a lower standard of supply is taken (say 1,000 to 1,500 cubic feet per hour), there will be a perceptible deficiency of purity, which will have to be made up by an hourly opening of the windows on the occasion of recess.

If the contents of a school room equal 200 cubic feet per head, the entire air of the room will thus be renewed every four to six minutes. It is found by experience that the draft caused by the inrushing air need not be troublesome in rooms which allow this amount of space per inmate. It is recommended that this be the average allowance of space.

In testing air for carbon dioxide it is important to take samples from the level of the pupils' heads, avoiding the admixture of breath. If the condition of the air at that level is satisfactory the end of ventilation has been gained.

The rapidity with which the air leaves the room may be ascertained by the use of an anemometer. In addition to this test it is desirable to apply the chemical test for comparing the discharged air with that of different parts of the room; for if the supply of fresh air is badly distributed, it may happen that in some parts of the room the currents are comparatively stagnant, and the air will grow more impure than the average of the room.

The animal impurities of the expired air (exclusive of carbon dioxide) are probably, in part, of a poisonous nature. They perhaps include ptomaines as results of putrefactive decomposition. They are of infinitely more importance than the carbon dioxide which is associated with them; but they cannot be conveniently made the subjects of quantitative test; hence, the dioxide test is employed, as indicating with probability how much the air has been affected by respiration.

The mere removal of foul air, whether by stoves, fireplaces, or ventilating flues, accomplishes but one-half of the duty of ventilation. The other half consists in supplying a quantity of fresh air equal in bulk to that removed. It often happens that no special provision is made for this supply; in this case the air entering is drawn from many sources, out of doors, the halls, the closets, the cellars, and indirectly from many undesirable places. Special ducts, therefore, are requisite for leading pure outer air in large quantities to the school room.

Such large quantities as are required cannot be safely introduced without previous warming. But the rapidity with which the air is changed is so great that a high temperature is not required; as a rule, heating can be effectually performed with air not hotter than 100° F. If the ventilation is sluggish, the air needs to be made correspondingly hotter in order to keep the room warm; but air thus overheated is apt to have

* Extract from the report of the committee on school hygiene presented to the section on state medicine at the forty-fourth annual meeting of the American Medical Association, Milwaukee, by D. F. Lincoln, M.D., chairman.

an odor which indicates that it has been n some way injured in the process.

The locality from which the air supply is drawn should of course be such as to avoid impurities—dust, smoke, and bad smells.

A system of ventilation which is working well and efficiently will produce a near equality of temperature in all parts of the room. The difference between the temperature at the floor level and that at five feet from the floor should not exceed 5 degrees.

A system is efficient in proportion as it maintains its activity under widely varying outside temperatures. Ventilation is needed at 40 degrees as much as at zero, but it is much harder to keep up a sufficient action in the former case. If the system is based on the draft of heated flues, some additional means for increasing the heat of the flues ought to be available for such mild weather.

The relative humidity of air commonly breathed in our winter climate is low compared with western Europe. It becomes of necessity still lower when warmed. It is not proved, however, that the dryness thus obtained is generally prejudicial to health, either in schools or hospitals, although some individuals appear to require greater moisture. A part, if not the whole, of the unpleasant effect of breathing superheated air is due to the bad ventilation and the excessive temperature.

The thermometer placed at five feet from the floor should mark an average of 65 to 70 degrees in our climate. This is considerably higher than is found desirable in western Europe.

be considered normal or regular, but only to be applied when heat is excessive, as, for instance, in evening schools with artificial light.

It is possible to apply the above principles to the ventilating of the smallest school house. A single room can be heated with an upright cylinder stove of ordinary construction having around it an air space inclosed by a jacket of sheet iron. In the floor beneath the stove an opening is made, connecting with a flue led to the outer air, through which there will be a rapid and abundant inflow of pure warmed air. The supply flue may run in two directions, so as to be exposed to different winds, and each point of opening should be guarded with a valve. For the escape of foul air, openings near the floor are made in the brick chimney-flue, which should stand at the far end of the room. The stove funnel is carried across the room into the chimney, and its heat insures an upward draft. Open grates and ordinary stoves are aids to ventilation, but perform only a small part of the duty required.

Direct radiation, or the use of steam heaters in the rooms to be warmed, furnishes no supply of fresh air. If ventilation is fully provided for, as above described, direct heating is admissible as a supplemental supply in exceptional cases; but as a rule its use is destructive of good ventilation.

Effective work can be done either by furnaces or by steam heaters in the cellar (indirect radiation). In both cases it is exceedingly desirable to provide liberally in respect to the size and power of the apparatus.

On the question of economy in ventilation, and the necessary expense of good ventilation, much may be said. A great amount of warm air is necessarily thrown away in ventilation. It is estimated that a very perfectly ventilated building, filled with students, expends 50 per cent more coal than the same building empty and closed, the temperature being the same. This difference would be greatly lessened if we could compare the case of a well ventilated occupied building with one badly ventilated and occupied; the latter wasting, as it does, a considerable amount of heat by open windows and by the overheating which often accompanies bad ventilation. It is certain that the additional annual expense per pupil of the best ventilation need not exceed the price of one or two cheap lunches. The effect of perfect ventilation, where it has been tried, is to increase the pupil's power of work about 50 per cent, which is a direct saving to the town that pays for his schooling, to which must be added the gain in public health (which is not so easily to be estimated), since a large percentage of school children are suffering at present a perceptible diminution of vigor from the effects of foul school air.

The employment of automatic regulators for keeping school rooms at a given temperature is recommended as both economical and healthful. Modern

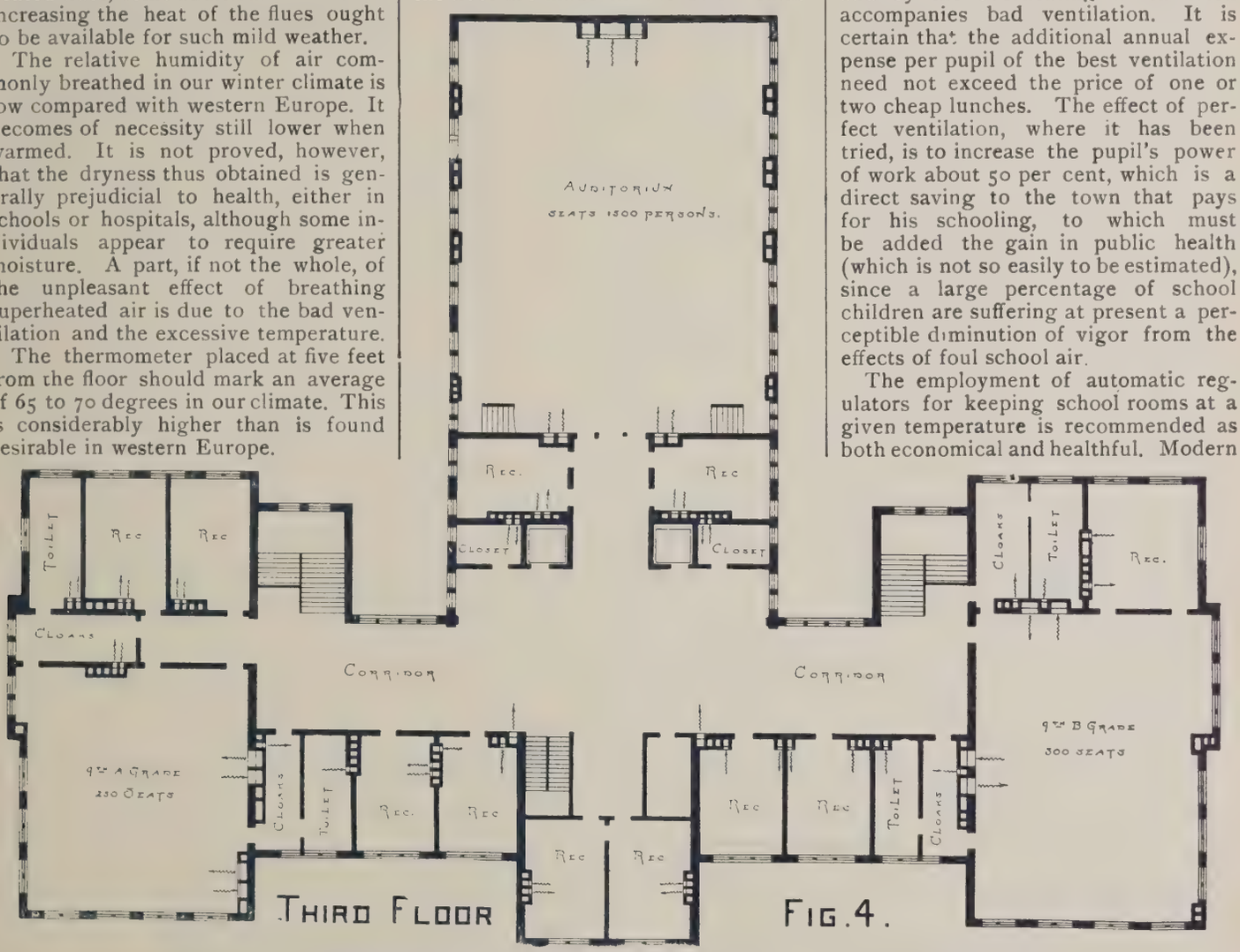


FIG. 4.

HEATING AND VENTILATION OF THE DETROIT CENTRAL HIGH SCHOOL, DETROIT, MICH.

It is to be presumed that the entering air is warmer than that which leaves the room, since it contributes a fraction of its heat for the warming of the walls and windows. If introduced at the upper part of the room it will therefore fall toward the floor by degrees as it becomes cooled. Hence a level near the floor is a natural one for its exit. The proportion of carbon dioxide at the upper level of the room is not essentially different, on the average, from that in the lower part, and the level of the orifice of extraction is a matter of indifference as regards that point. If it be our object to get rid of superfluous heat, we should discharge the air from the top; this, however, is not to

methods often uselessly overheat the cellar in which the furnaces stand. Waste steam from the boilers ought to be converted to the use of heating radiators. A liberal salary to janitors or engineers may insure a more intelligent control of the fuel.

The available methods for compelling air to move in ventilating flues are practically two: (1) the ascensive force of heated air; (2) fans driven by steam or electricity for forcing air into the room or drawing it out by suction. For the former method, it is generally desirable to make available the otherwise wasted heat of smoke flues, by causing them to run through the foul-air shaft

A Chat About Chimneys.

Leicester Allen

If all the heat could be abstracted from the gases of combustion produced in our boiler furnaces, once remarked a very bright minded young engineer, we should have to reverse our practice, and put our grates at the tops instead of the bottoms of our chimneys. The water vapor would become condensed to water; and the carbonic acid, being heavier than ordinary air, would fall, instead of rising; and we should select for factory sites the tops of hills, down whose sides we might run our flues, so that the smoke and water-drip could flow down through them in the same way as water drains from a sink.

In this is comprised a clear understanding of one of the fundamental principles of natural draft in chimney flues; namely, that there is a limit beyond which heat cannot be abstracted from the outflowing gases without interfering with draft. I do not propose to dwell upon the much debated question whether chimneys, independently of heat imparted to their interiors, have power to draw through them currents of air or smoke. Science has successfully taken the negative side of this question, and proved that, in still air, what is commonly called "draft" is not strictly such, but merely a phenomenon of gravity which pulls down the heavier, because cooler, air, and pushes up the lighter, because warmer, smoke, in the same manner that a cork rises through water as the heavier liquid flows under it and pushes it upward. In this view, draft is merely an act of buoyancy. Yet no man who has experience in the heating business has failed to find chimney flues that have stood unused for years, and which must, to all appearance, have taken the same temperature as the surrounding air, and yet which will indicate an upward circulation if a light handkerchief be held over a pipe-hole near their base.

Do chimneys, therefore, draw whether they have fires burning at their bases or not? In the sense that currents of air go through them, I answer that most of them do. And I will add that if a handkerchief be held at the top, perhaps as many could be found to draw downward as in the opposite direction. Very seldom will a long and narrow passage, open at both ends, whether vertical or horizontal, be found without a current of air flowing through it in one direction or another; and, whether in chimneys or hallways, such currents are called "drafts."

This question of draft is one which has to be considered very early in planning and estimating the cost of a heating plant. When a salesman brings in a request from an owner or architect for an estimate upon a proposed job, one of the first questions asked will be, "Are the flues sufficient?" The question implies a possible insufficiency. The experience of most men in the business of heating justifies the assertion that all flues should be considered guilty until they are proved to be innocent, thus reversing a legal adage. Of course, if a good and sufficient flue is guaranteed to the contractor, the funeral, if there is to be one, will not be at his expense; but there are plenty of cases where owners, knowing nothing of the requirements, refuse to make such guaranties, and the contractor must accept some one of such flues as there are, or lose his chance of getting the contract. How he may satisfy himself either that a flue can be relied upon, or that it is untrustworthy, is the practical question he has to meet, and it is independent of the theory of draft.

A common way is to ascertain by measurement the size at top and bottom, and then, by various methods, to find if possible whether there are any contractions, enlargements, or bends. The heights of chimneys vary much in different buildings; and although this is theoretically an important point in determining the draft-power, it is rather curious that in practice variation in draft-power caused by difference of height is not so great as theory calls for. Position is an element so pronounced in its influence upon draft that in many cases it more than compensates for difference in height; and a liberal size of flue, when well situated, will often compensate for lack of height.

I have often seen boilers and furnaces working in the open air with surprisingly short smoke-stacks, and seemingly burning their fuel as perfectly as though they were attached to chimneys

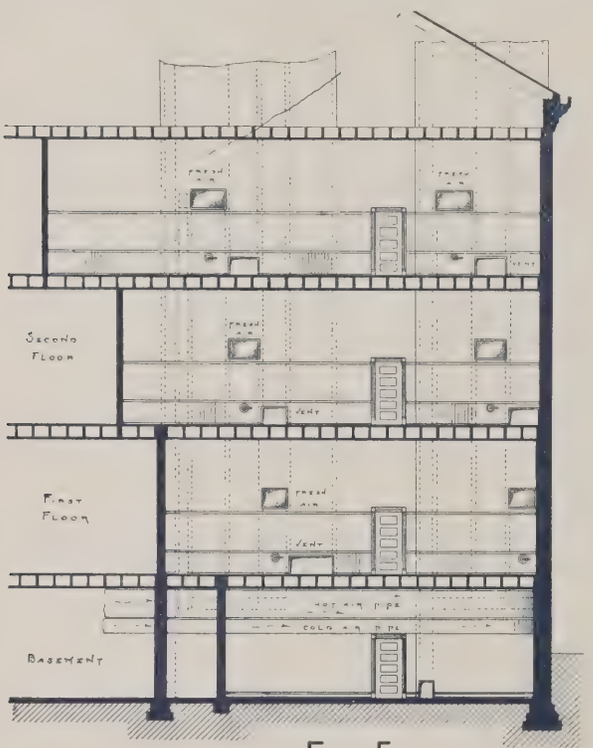


FIG. 5.



FIG. 8.

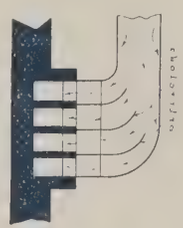


FIG. 9.

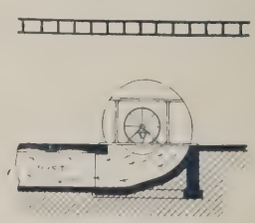


FIG. 10.

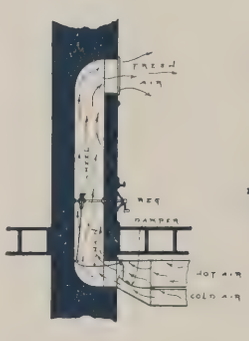


FIG. 11.

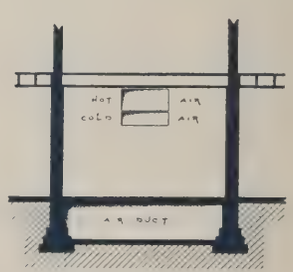


FIG. 12.

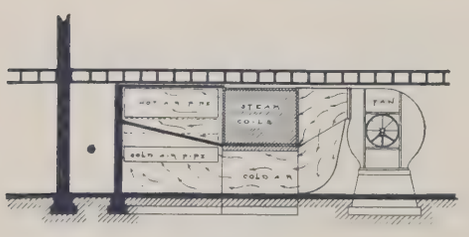


FIG. 6.

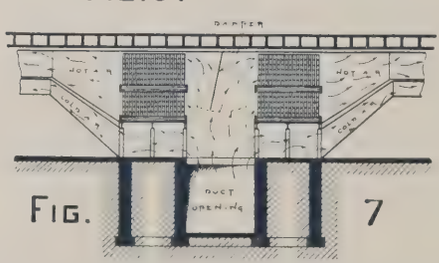


FIG. 7.

Details of the Heat. & Vent. Plant — for the — Central High School — Detroit, Mich.—

HEATING AND VENTILATION OF THE DETROIT HIGH SHCOOL, DETROIT, MICH.

three or four times as high. I also call to mind a chimney flue over 100 feet high and 100 square inches in cross-section, to which a heating boiler rated at 1,000 square feet of heating surface was connected, working no better than the same boiler worked connected with a chimney of the same cross-section and 30 feet high. It is extremely difficult to account for differences of draft-power in chimneys. The influences which affect them are very elusive.

It is common in practice to test the draft-power of chimneys by burning paper or shavings of wood in them at the bottom ; but, although this affords a valuable indication, it cannot be relied upon in all cases. If the material burns sluggishly the reason may be that the chimney is wet and cold, though it might draw very well when dried out and heated. If the combustion is brisk the probabilities are in favor of a good draft when the boiler or furnace is connected with the chimney. But it is by no means certain in such a case that the draft will be satisfactory. The indications of such a test are more reliable if repeated on different days with winds blowing in different directions.

I have said enough, perhaps, to expose my belief that chimneys are always an uncertain element in the performance of a heating plant. The most valuable information that can be gained with reference to an old chimney standing unused is the statement of some reliable person as to its draft at former periods when it was used. A low chimney-flue having its area of cross-section a little below or only a little above the proper limit, and so situated that near surrounding objects such as roofs, gables, trees, or hills, overtop it, should make a would-be contractor pause, unless its sufficiency be guaranteed by the owner. And even if such a guaranty can be had, the owner should be warned of the extreme probability that the chimney will fail.

Haswell states that from 1 to 1.33 square inches of chimney-flue area at the base should be allowed for every pound of coal consumed per hour ; the smaller area being for boilers having small tubes as compared with their length ; and also that the intensity of draft in chimneys will be as the square roots of their heights. If, therefore, we compare a chimney 49 feet high with another 100 feet high, the intensity of draft in the former should be to that in the latter as 7 to 10. This would undoubtedly be correct were the atmosphere a dead sea of gas ; but as it is nearly always in motion, and its motion directly influences chimney draft, and as proximity of buildings, hills, etc., also affects the operation of the law stated, the heating engineer will not be able to go implicitly by these rules.

Baldwin, in his treatise, gets the matter into a more practicable shape. He insists that "an 8 by 12 inch chimney is the smallest that should be built in a house for a heating apparatus ;" and that "for apparatus such as are put into large mansions and which burn 40 to 50 tons of coal in 180 days, a 12 by 16 inch flue is little enough." He gives, "as a rule for area of cross-section, in rectangular chimneys from 30 to 50 feet high, 1 square foot of cross-section for every 75 pounds of coal burned per hour ; and for rectangular chimneys, 30 to 50 feet high, with not less than 16 inches on the side, 1 square foot of cross-section to 50 pounds of coal burned per hour." These last are good and safe rules to follow.

Another element which should be taken into account is the interior of the chimney, which should be smooth, made so either by plastering or by tiles ; but this is a point too well recognized to be dwelt upon, and is generally well considered by contractors where chimneys are not guaranteed. The principal error is the acceptance of flues having too small area of cross-section, provided they are straight and well built. Such flues often tempt contractors into taking risks that, as a rule, it is wise to avoid ; not the less because sometimes a success in the beginning will attend the use of such a flue under exceptionally favoring conditions, and, like a prize in a lottery, encourage a disposition to take chances that in the long run will result in losses.

School House Heating and Ventilation.

W. D. Dickson

VENTILATION.

The first requisite of good health is pure air. The human body will adapt itself to all conditions, and when deprived even of pure air it manages to exist for a time without it, but the end is always inevitable. What the penalty is that we are called upon to pay for the neglect of proper sanitary precautions one can see by reading the histories of 150 years ago.

In those days, in England, criminals were crowded into the common jails without any attention being paid them. The rules of cleanliness were neglected. The consequence was that the assizes were dreaded in every shire town more than we now dread an outbreak of cholera, for when the wretches were brought into the dock to plead they were accompanied by the terrible jail fever. This malady swept off jurors. judges, and attorneys by scores. In vain did the judges sit with their handkerchiefs saturated with camphor wrapped around their heads. In vain was the pan of hot coals brought into the court room and juniper plentifully burned in order to protect the juror. The judges often carried the terrible malady to their homes, whole neighborhoods were infected, and oftentimes the adjournment of the criminal court was marked as the outbreak of a pestilence that swept off a very considerable part of the community.

In those days these outbreaks were regarded as the punishment meted out by an angry deity to a corrupt and fallen world. He was only to be propitiated by fasting and by prayer, by humiliation and terror. Now we have learned a little better. The judgment is the result of filth and of lack of pure air. Wherever there is typhoid fever, wherever there is diphtheria, wherever there is scarlet fever, there is always ill ventilation. These maladies nowadays rage in the public schools,—and why? Precisely because the average public school building is the worst ventilated place occupied by civilized beings. Fifty children are crowded into a room, partitioned off in an architectural box, and they are sometimes compelled to sit there for an hour and a half without a particle of fresh air.

Their clothing (especially their wraps) is hung up in a tight room for half a day. The medical world knows that these are precisely the conditions needed to propagate the bacillus and the microbe. A child comes from a family where there is diphtheria. What better medium is required to develop this than in a close atmosphere packed with the clothing of other children? It has been clearly demonstrated that the microbe that creates pulmonary consumption exists in the sputa of infected individuals, and that this sputa or spittle when ejected upon the floor or upon the wall dries without injuring the vitality of the microbe. When converted to dust and agitated by a broom or a duster these microbes rise in the air.

Let a person whose lungs are abraded by sore throat, by a hard cold, by bronchial trouble, or by a severe cough, enter that room, and the chances are in favor of his catching pulmonary trouble. It simply depends upon whether these microbes find their way into the lungs and lodge on one of these abraded surfaces, without being discovered by the white corpuscles.

It is evident, therefore, that many cases of what we call hereditary consumption result from the simple neglect of the commonest sanitary regulations. The more people are packed together the more danger they run. If we would have healthy children we must have well ventilated public schools,—ventilated not only in the assembly room but in the class room, the halls, the cloak and hat rooms, and the closets. It is possible to do this without expensive machinery, without either fans, siphons, or gas. It depends simply on the construction and arrangement of the flues.

The problem is perfectly simple. Each pupil needs 2,000 cubic feet of pure air every hour. This must be supplied. Each pupil vitiates 2,000 feet of air per hour. This must be taken away. The work cannot be done by small flues, nor can it properly be provided for after the building has been erected. The subject is so important that it must enter into the very construction of the edifice itself and begin at the foundation.

An architect in the building of a school house ought to start with the proposition, How can I best supply each pupil with 2,000 cubic feet of fresh air per hour warmed in inclement weather to 70 degrees? Any system that does this is a good system, it does not make any difference by whose name it is called ; and any system that does not do it is a poor system, no matter under whose auspices it may flourish.

Heating and Ventilation of Residences.—IV.*

James R. Willett

HOT WATER HEATING—USUAL METHOD.

There are various ways to arrange the pipes from boilers to radiators and from radiators to boilers. The usual way, as shown by Fig. 1, is by feed pipes leading from the boiler to the stack of radiators, that is, radiators which are directly over each other, but on different floors.

The water passes into the radiators, and there it gives off its heat, and then passes out from the radiators into a return pipe, which is represented by the colder column, and returns to the boiler. This process continues as long as there is a fire in the boiler. The feeds and returns are separate pipes.

The pipes leading to the upper story, having a higher column of warm water, have more motive force, and therefore have a tendency to rob the lower-story radiators. These are made smaller. In other words, the size of the pipe is decreased as it goes upward from story to story, while the return pipe increases as it descends.

Another way of checking the excessive flow to radiators in upper stories is to supply the radiators on the lower floors from the top of the tee, and to supply the radiators in the upper stories from the side branch of the tee.

The feed connection to the radiators usually has a valve upon it, so that it can be shut, and the circulation of water stopped; while the return connection has no valve.

In this method of hot-water heating, air cocks are needed at the top of each radiator, there being no other way to allow of the escape of air. Pet cocks are sufficient.

There are two pipes, a feed and a return; and there are two connections with each radiator, the feed and the return, usually both connected with the bottom of the radiator, but sometimes the feed connects with the top of the radiator.

This method requires more radiator surface than the overhead method which has already been described and which is shown in Fig. 2. The requisite amount is found by calculating that required by the overhead method and then adding twenty-five per cent.

The grate area, expansion tank, etc., will be ascertained in the same way as in the overhead method. The expansion tank should be connected with the boiler by an independent pipe one inch in diameter, without a valve, running from the bottom of the tank to the bottom of the boiler.

One objection to the foregoing method is that each stack of radiators has two pipes, a feed and a return. As a feed usually runs through the rooms, to clothe it would render it large and unsightly, therefore it is usually left uncovered, and since it gives off heat, this tends to diminish the rapidity of the circulation. Another objection is that the upper story radiator has a tendency to rob the radiator in a lower story. These radiators, so to speak, "fight" each other.

HEATING BY STEAM.—LOW PRESSURE STEAM.—GRAVITY RETURN.—ONE-PIPE METHOD.

Low pressure steam may be defined as a pressure not above fifteen pounds per square inch above the pressure of the atmosphere. The atmosphere, as you know, has a pressure of about fifteen pounds per square inch; and what is termed low pressure steam is not usually more than five pounds pressure above the atmosphere, though it may be run up higher. When we speak of pressure we always mean a pressure shown by a steam gauge on the boiler, and means that much above the pressure of the atmosphere.

When the condensed water in the radiators returns to the boiler by its own weight it is called "gravity" return.

With regard to piping from main pipes to radiators it may be said that up to some years ago there were two

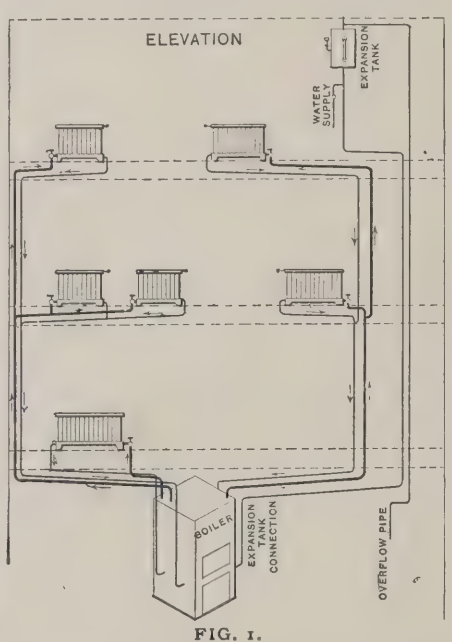


FIG. 1.

pipes for this purpose. One main pipe passing out through the top of the boiler and through branches called "feeds" carried the steam to the radiator, where it was condensed, and the water resulting therefrom returned by means of other branch pipes called "returns" to a main return which led to the bottom of the boiler. This is what is called the two-pipe method. Of late years, however, the tendency is to use what is called the one-pipe method, as shown in Figs. 3 and 4.

In the one-pipe method the main usually rises from the top of the boiler as close to the ceiling in the basement as is practicable, then turns and runs horizontally, but with a downward slope, so as to reach points below the radiators on the floor above, as shown in Fig. 3. After reaching all these points, this main drops beneath the floor of the basement, and returning, enters at the bottom of the boiler. From the upper horizontal portion of the main, branches are taken, running upwards to reach the radiators above, there being but one connection with each radiator. This pipe, called by the trade a "riser," has to carry steam to the radiator and return the water from the radiator. It has been found that if this riser is made of sufficient size it will do both, and do them well. It has the advantage of having one connection and therefore but one valve to each radiator.

In the two-pipe method you have two connections with the radiator and a valve on each. If the feed is left open while the return valve is shut then water collects in the radiator, and when the feed is opened again and steam enters, it is condensed, and noise which is called pounding ensues. The water being in the radiator, it may freeze, since there is no circulation of steam through the radiator. On the other hand, if the feed should be shut and the return valve left open, no steam would enter the radiator, and any steam already in the radiator would be condensed and a vacuum formed therein, which might cause water to pass up the return pipe into the radiator. This is not a safe proceeding, since the passing of the water from the boiler lowers the water line, and may lower it dangerously.

In a steam boiler the water must be kept a certain distance above the smoke tubes or flues. Water must not be kept too low, for then the metal composing the boiler is exposed on the one side to the heat of the smoke flue, while on the other side there is no water to convey away the heat, and the metal (iron or steel) may be injured thereby; besides, when other water enters the boiler and strikes this exposed metal surface it may generate steam so rapidly as to cause an explo sion.

With the one-pipe method there is but one valve. If it is open it admits the steam and also allows the water to pass away; if it is shut it allows neither the steam nor the water to enter. A person cannot, therefore, misuse the radiator in this respect, while with the two-pipe radiator it is a common occurrence for careless people (and all people are careless) to leave one of the valves shut while the other is left open.

I saw, not very long ago, in one of the architectural papers of this country, the statement that the one-pipe method was not regarded as a reliable and efficient one by experts in heating and contractors of repute. However that may be in the locality where such a journal is published, it is certainly not true of Chicago. There the two-pipe method for buildings, especially large ones, had become almost if not quite obsolete; and not only is this true of the young men who contract for putting in heating apparatus, but the old contractors, who until a few years ago, knew no other than the two-pipe method, are now using the one-pipe method almost exclusively. No one who has ever used a well-designed one-pipe method will ever use the two-pipe method except under special circumstances.

I will here speak of the "low press-

* Extract from an address delivered before the Engineering Societies of the University of Illinois, reprinted from the Inland Architect. Copyrighted, 1893, by the author.

ure, one-pipe, gravity return" method exclusively. It may be noticed that in the main, since it pitches downward, as shown in Fig. 3, both the water and the steam flow in the same direction and therefore they do not "fight" each other. The condensed water in the mains returns to the boiler through a main return.

In the branches or risers the steam is moving one way and the water in the other, and this requires large pipes, especially in the horizontal portions of the branches.

Sometimes the steam is supplied by the "overhead" method, which is similar to the overhead method of hot-water heating, except that there is one connection with a radiator, and that is at the bottom, a main feed being run up to the attic whence branches run out and downward, supplying the radiators as they descend, as shown in Fig. 4. This is a good method, probably the best.

What has been said in regard to steam heating refers to what is known as a low pressure gravity apparatus, that is, the steam is at a low pressure, and when condensed into water returns directly to the boiler by its own weight. This is almost exclusively the way used for ordinary residences, but for large apparatus the water is sometimes returned to a tank, usually called a receiving tank, and from thence pumped into the boiler. It is sometimes, however, returned from the receiving tank into the boiler by what are called steam traps. These traps, however, do not usually work well except in what is termed a high pressure apparatus.

It is becoming the custom nowadays on large work, and especially where steam of a high pressure is needed for other purposes, to run the boiler at a high pressure and to run the heating apparatus at a low pressure. This is accomplished by having a "pressure regulator," or governor, on the house-heating main. By means of this pressure regulator, while the pressure on the side toward the boiler may be high and fluctuating, the pressure of the side from the boiler, that is, of the side toward the heating apparatus, is kept at a low and nearly steady pressure. This, as I have mentioned, is used in large buildings; sometimes in flat buildings, which might be termed residence buildings. By this means the steam pressure in the boiler is kept high and well adapted to run elevators, pumps, laundry and other machinery, etc., while the pressure in the heating apparatus is kept low.

The connection from steam pipe to radiator should connect with the bottom of the radiator, which connection should have a valve upon it. Each radiator should be provided with an automatic air valve. In steam radiators, the sections or loops forming the radiator are connected at the bottom only.

To ascertain the necessary surface in the direct radiators.—For direct radiators take the formula:

$$Q = R\,F\,J$$

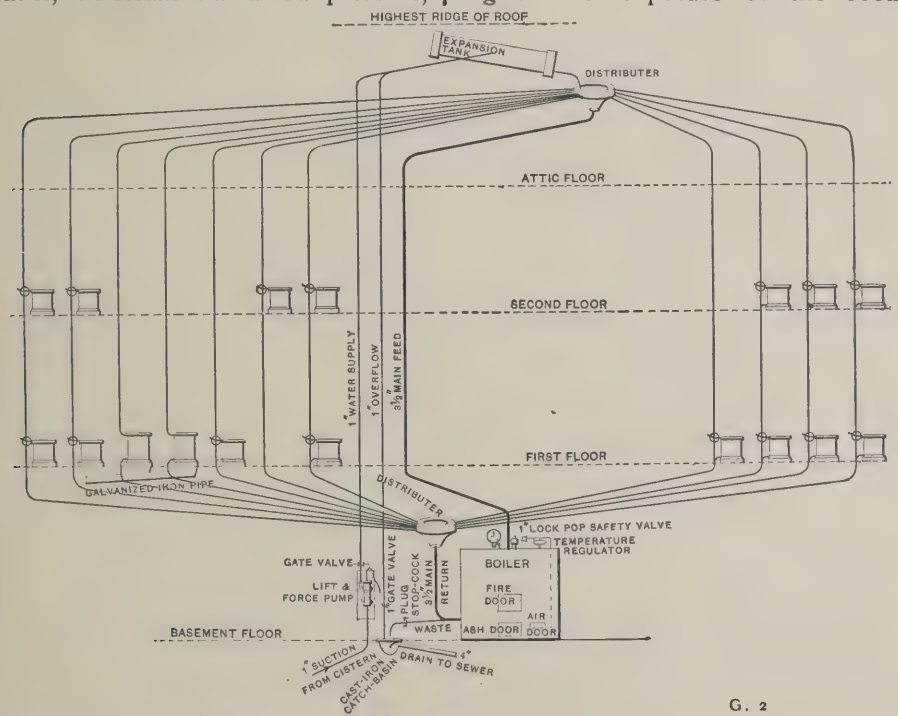
Where Q = total square feet radiator surface required in a room; F = the constant 0.8; J = a factor depending on the exposure of the room, usually 1.4 for north and west exposures, 1.0 for south and east exposures.

For bathrooms take $J = 2$;

For kitchen take $J = 0.5$.

Direct radiators in entrance halls or near outside doors should be largely increased, as heretofore mentioned. The factor J may be taken as 2, or twenty-five to fifty square feet may be added. It is always a good plan to have large radiators near outside doors.

The quantity of fresh air that is necessary to ventilate the residence is to be obtained by rules already given, and this air should be admitted through direct-indirect radiators into stair halls, as heretofore mentioned. The indirect radiator should contain at least one-half of a square foot of surface to each square inch of cross-sectional area in the fresh air duct. It is better if the surface of the indirect radiator is increased fifty per cent or more.



G. 2

The diameters of the main feed can be taken from Table I. No return from a main should be more than two sizes smaller than the feed at its commencement (or than its largest dimension). If the main should also be used as a return, which is neither usual nor desirable, except in special cases, then such main should be made one size larger than given in Table I.

TABLE I.—SIZES OF PIPES CORRESPONDING TO RADIATOR SURFACE SUPPLIED BY THEM.

Diameter of pipe in inches.	Maximum square feet of radiator surface that it will supply.
1	40
1¼	70
1½	110
2	220
2½	360
3	560
3½	810
4	1,110
5	1,000
6	3,000

Mains should rise vertically from the boiler in the basement as high as is practicable, that is, as high as the basement ceiling permits, and then turn and run horizontally, but with a downward slope, so as to reach within a few feet of the necessary points to supply the radiators. Then after having supplied the branches it usually turns and runs down below the basement floor and returns to the boiler. In all cases it should have a slope, and at its lowest point a waste cock, so that it can be emptied.

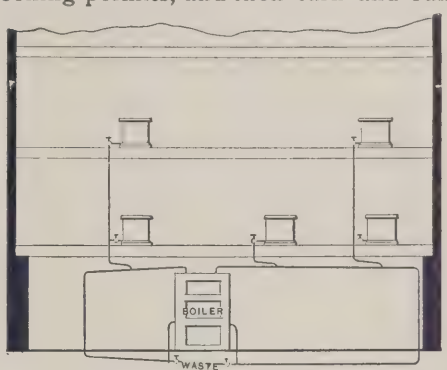


FIG. 3.

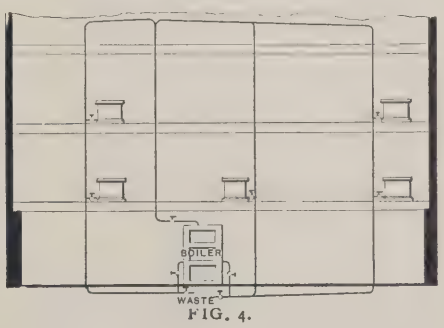


FIG. 4.

The diameter of branch pipes necessary to supply the radiators can be taken from Table I, but a branch or riser when it leaves the main has to run nearly horizontal (but with an ascending slope) from the main to the point where it turns and runs vertically upward. This horizontal portion should be one size larger than the vertical portion, that is, it should be one size larger than given in Table I which is intended for the vertical pipes.

Add together the square feet of direct radiation and indirect radiation, obtained as before mentioned, and multiply their sum by 1.1. Considering the

product as the radiator surface, take the corresponding grate area from Table II.

For steam heating it is important that the boiler has capacity to hold a sufficient volume of water, so that when enough of the water has been evaporated to fill the pipes, radiators, etc., with steam, the water line in the boiler will not be lowered too much, and the tubes, or other heating surface, become uncovered by the water. It is also necessary to have ample steam space in the boiler above the water. For residences you usually must take some ready-made type of boiler. When you know the required grate area, select one having not less than the calculated grate area. A pop safety valve should always be put on a steam boiler; usually a one-inch valve is sufficient. A pressure gauge should also be put on a steam boiler.

TABLE II.—PROPORTION OF GRATE SURFACE TO RADIATOR SURFACE.

Square feet of radiator surface.	Square inches of grate surface.
100	120
200	208
300	288
400	362
500	433
600	501
700	567
800	630
900	693
1,000	754
1,100	813
1,200	872
1,300	930
1,400	986
1,500	1,040
1,600	1,100
1,700	1,150
1,800	1,210
1,900	1,260
2,000	1,310

Furnace Work—II.

James A. Harding

There are four positions in which to place a register—first, where the customer thinks it will give the best result; second, where the furnace man knows it will give the best result; third, where the structure of the building will permit the proper running of a hot air pipe; and fourth, where it will be least objectionable. The best position for a register is to be ascertained by making the conditions above named four elements of the problem and then working it out to its logical conclusion.

The first condition should be compromised by urging the importance of the other three.

The second is best expressed by the axiom, "A register will be most effective when placed in that part of a room nearest the furnace," and this is true as regards the entire room, whatever the exposure of its sides remote from the furnace.

The third condition involves the question of judgment, and it is to be exercised independently in each case.

In considering the fourth condition it is proper to remark that registers in almost any position are objectionable to a degree. There are in every house certain customary articles of furniture for the accommodation of which the painstaking architect will make provisions in his plans, and, to earn the distinction of possessing common sense, the furnace man cannot afford to disregard such provisions.

In the absence of any instructions in this connection the furnace man should bear in mind that it is against his interests to offend by improperly placing the registers. He should therefore be regardful of the fact that there must be reserved unobstructed wall spaces in which registers cannot be placed as follows: in the hall, for the hat rack and usually a seat; in the parlor, for the piano, the popular style of which is about 5 feet 6 inches long; in the dining-room, for the sideboard; in the library, for book cases; and in each chamber, for a bed requiring a space 4 feet 9 inches by 6 feet 6 inches and dressing case about 3 feet 6 inches long. These articles of furniture are essential, and must have proper spaces allotted to them. Beds and pianos should stand against inner walls if possible. Except the articles named the furniture can be adapted usually to the position of registers. Do not place a register under a gas fixture, for the current of air from it will cause the gas to flicker.

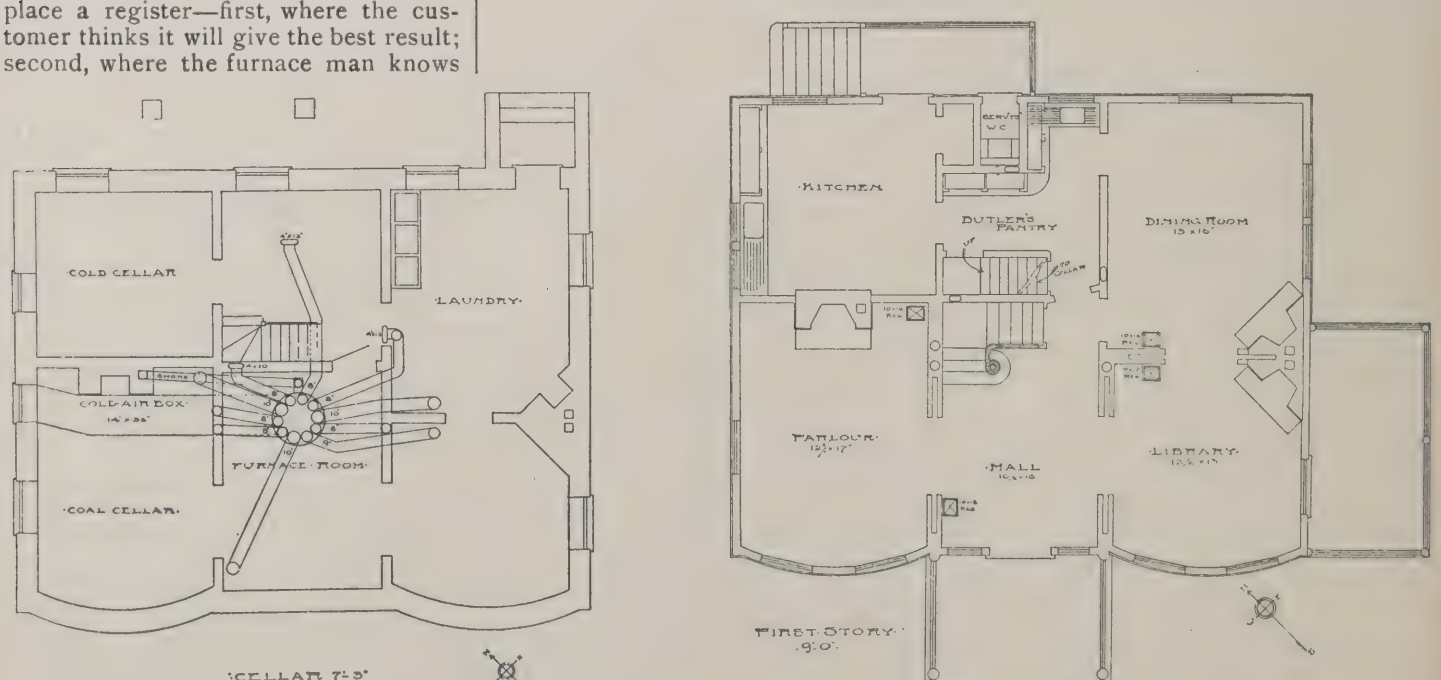
It will be noted by reference to the plans submitted that the foregoing conditions have been met. It is true the library register occupies a small wall space which might be required for books, but this is necessary to avoid placing the register at the opposite side of the room and running the pipe twelve or fifteen feet further. The hall register could be placed directly over the furnace, but in such case the pipe would be so short and direct as to give it an undue advantage over the other first-story pipes, whereas it is desirable to equalize this advantage, as before stated, by having the pipes of nearly equal length.

The cold-air box is second in importance to no other feature of a job, and upon its proper arrangement depends the success of the furnace. It should not be left to the tender mercies of the carpenter, who usually does not comprehend its significance, but directions for its construction should be carefully and minutely given by the furnace man, and his responsibility for the success of the plant should only begin after such directions have been faithfully carried out.

The point of the compass from which to run the cold air box to the furnace cannot be determined to a certainty, and it is in this particular that the expert furnace man is most liable to be in error. It is unnecessary to say that it should proceed from the direction of the prevailing winds, then it will for the greater part of the time perform the office of assisting circulation through the hot-air pipes.

When the wind is blowing in the direction of the box toward the furnace the effect is an air pressure in the furnace chamber and the acceleration of the flow of air through the hot-air pipes. The cold-air box thus co-operates with the natural tendency of the air to rise when heated.

When the wind is blowing strong



Plan of Cellar and First Story, Showing Location of Furnace, Hot-Air Pipes, and Registers.

from an opposite direction the effect of the cold air box is reversed. The wind pressure against the side of the house opposite that from which the cold-air box proceeds will sometimes cause a reversal of the air current

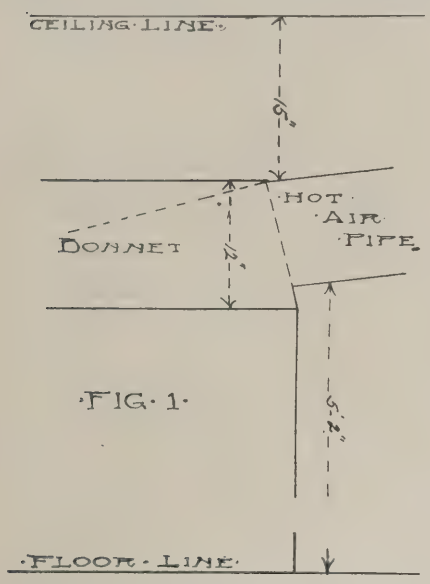


FIG. 1.

through the box, with the result of driving all the heat of the furnace out of doors, and the consequent cooling of the house. Even when the current is not reversed, the effect is to materially retard the natural flow of the heated air through the pipes. When a house is unprovided with fireplaces or other means of vent for the air, this contrary action is most liable to occur, hence the importance of leaving the fireplaces open. Right here it might be well to refer to the quite common practice of setting registers in fire places: a most pernicious and fatal error.

One remedy for a reversal of the flow of warm air is to build an additional cold-air box from the opposite side of the house and to use one or the other according to the direction of the wind.

According to the generally accepted idea the office of the cold-air box is to furnish a supply of fresh air to the apartments warmed, and if it were not for outer air currents (winds) its effect

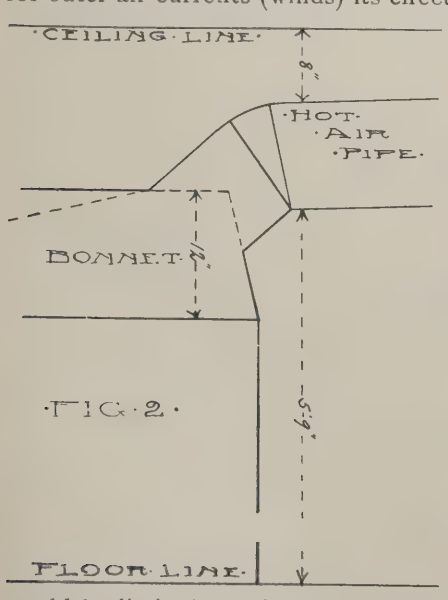


FIG. 2.

would be limited to the performance of that duty. The outer air currents, however, render it either an assistant or a preventive in the matter of heating the building. Its activity and the consequent effect upon the purity of the atmosphere of the house are dependent in direct ratio upon the provisions for ventilation which have been made.

To obtain a uniform circulation through all the pipes some study should be given to the manner of connecting the cold-air box to the furnace. If connection be made below the floor through a pit under and the full size of the furnace air chamber, the free circulation thus afforded to all sides of the furnace will give the pipes from all sides an equal advantage. If, however, connection be made above the floor it should be at the rear, then the current of air entering the air chamber is divided and diverted to either side by the ash pit of the furnace, and the pipes on either side have an equal advantage.

If connection be made above the floor and at the side, the pipes on the opposite side will show a deficiency of supply at times when those on the side where the cold-air box enters are discharging a full volume of air.

Avoid if possible connecting a first-story pipe with the furnace directly above the feed door, for in such case the obstruction of the feed neck and ash

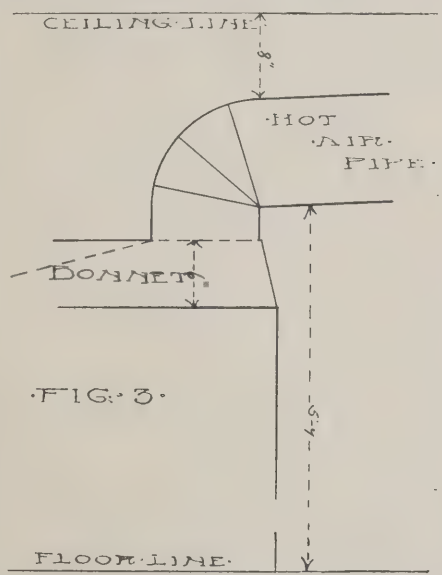


FIG. 3.

pit front to the passage of air will destroy the effectiveness of such pipe.

The advantages of connecting the cold-air box with the furnace above the floor are cheapness, saving of time usually lost in directing construction of pit, water tight and dry floor under the furnace, and avoidance of incidental obstruction of air supply sometimes resulting from collection of surface water drainage in the pit.

Reasonable economy in fuel demands that the cold-air box should be partially shut off during zero or colder weather, and it is a reasonable demand, also, that all pipes should then discharge air approximately the same. The cautious furnace man will put dampers in all of the hot-air pipes as a means of equalizing the distribution of air. It is a fortunate achievement where all pipes circulate equally well without dampers.

The manner of connecting the hot-air pipes with the top or bonnet of the portable furnace is a matter of considerable importance. Rise or grade is the desideratum in running the pipes, hence it is desirable to place them as low at the furnace end as will be consistent with a demand for head room in the cellar.

In this matter of head room the furnace man should not be autocratic, but rather agree to a compromise of extreme views.

The three general methods of connecting the pipes are illustrated in the accompanying cuts, and as the cost of this work is an important item it might be well to mention that Fig. 2 represents the most expensive method.

For the sake of comparison let Fig. 2 be represented by 100 per cent of cost, then Fig. 1 can be expressed by 45 per cent and Fig. 3 by 70 per cent. In making these comparisons the cost of the elbows shown in the cuts has been estimated.

Fig. 3 does not illustrate expert workmanship, but is for many reasons the most desirable; the 6-inch bonnet, however, cuts down the air chamber above the furnace radiator to one-half its size in Figs. 1 and 2, and this air chamber is of importance as an accumulating space and equalizer of discharge. The head room and consequently pitch of the pipes are about the same in Figs. 2 and 3, and where the economy is not too severe the work should be done according to Fig. 2. In Fig. 1 the pitch of the pipe is greater, but the head room insufficient. This method is not advised except for very low cellars.

One word about pitch of hot-air pipes. A very considerable increase in the pitch of cellar pipes is necessary to show a perceptible increase of air circulation. Raising the register above the floor level will prove more effective.

Ventilating (by exhaust) *the room is the best remedy for defective circulation.*

The mechanical details of the work will receive attention in the next article.

Steam and Hot Water Fitters' Guide.

[As the series of rules which it was proposed to give in answer to question 117 as to how to proportion radiating surface for direct steam radiation was not completed last month the remainder is given this month. Later on, after taking up the proportionment of direct hot water radiation, the various rules will be applied in figuring the radiation for an actual room, the results being given in tabular form for purposes of comparison between the different rules and between hot water and steam.—EDS.]

"Divide the cubic feet of space of the room to be heated, the square feet of wall surface, and the square feet of glass surface by the figures given under these headings in Table I and add the quotients together; the result will be the number of square feet of radiating surface required."—*F. Schumann.*

"With the external air at zero one square foot of radiating surface will warm 50 cubic feet of space in dwellings, 125 cubic feet in wholesale stores, 100 cubic feet in retail stores, 70 cubic feet in banks, offices, and drug stores, 80 cubic feet in dry goods stores, 125

cubic feet in large hotels, and 200 cubic feet in churches."—*Charles A. Smith.*

UNION RULE, PART I.—"Multiply the square feet of glass and its equivalent by 1.25 and by 60, and the product is the cubic feet of air cooled per hour by the glass; to this add the cubic feet of air warmed per hour, multiplied by 1, 2, 3, or 4, according to the number of

TABLE I.—SPACE, WALL, AND GLASS SURFACE WHICH ONE SQUARE FOOT OF RADIATING SURFACE WILL HEAT.

Air change.	Steam pressure in pounds.	Space in cubic feet.	Exposure of rooms.					
			All sides.		Northwest		Southeast.	
			Wall surface, sq. ft.	Glass surface, sq. ft.	Wall surface, sq. ft.	Glass surface, sq. ft.	Wall surface, sq. ft.	Glass surface, sq. ft.
Once per hour.	1	190	13.8	7	15.87	8 05	16.56	8.4
	3	210	15 0	7.7	17.25	8 85	18.00	9.24
	5	225	16.5	8.5	18.97	9.77	19 80	10.20
Twice per hour.	1	75	11.1	5 7	12.76	6.55	13.22	6.84
	3	82	12.1	6.2	13.91	7.13	14.52	7.44
	5	90	13.0	6.7	14.52	7.60	15.60	8.04

times the air is to be changed, and the result will be the total cubic feet of air to be warmed per hour."—*Hood.*

PART II.—Multiply the total cubic feet of air to be warmed per hour by the heat units required per square foot per hour of heating surface to heat one cubic foot of air at different temperatures, which will be found in Table II, and divide this product by the number of heat units emitted per square foot per hour from the radiating surface at different temperatures, which are given in Table III, and the result is the required square feet of radiating surface.—*Schumann.*

Q. 118—What is the rule for proportioning direct hot water radiation?

A.—The following rules are used by the authorities whose names are given at the end of each rule, the first two being anonymous.

"Multiply the number of square feet of glass surface by 1.25, and to the product add $\frac{1}{16}$ of the exposed wall surface and $\frac{1}{32}$ of the floor surface, and the result will be the number of square feet of radiation required."

"(1) Multiply the contents of the apartment in cubic feet by the difference in degrees between the temperature of the external air and that of the internal air, and divide the product by the time in which the temperature of the apartment is to be raised multiplied by 190, and the result will be the radiating surface required for heating the air. (2) To the square feet of glass and its equivalent of exposed wall surface add $\frac{1}{8}$, multiply by the difference in degrees between the internal and external air, divide the product by 190, and the quotient is the radiating surface required to supply the heat loss due to glass and exposed wall surface. (3) Add the results (1) and (2) together, and the total number of square feet of radiating surface required is the result."

"Divide the difference in degrees of temperature between the internal and external atmosphere by the difference in degrees of temperature between the radiator pipes and the atmosphere of the apartment heated, and the quotient will be the square feet of radiation for each square foot of glass or its equivalent in exposed wall."—*Baldwin.*

"(1) Multiply the cubic contents by the number of degrees which the air is to be raised and divide the product by 190, multiplied by the time in minutes within which the effect is to be attained. The product will be the radiating surface required for heating the air in the apartment. (2) To the actual square feet of glass surface add $\frac{1}{3}$ of its amount, multiply by the number of

TABLE II.—HEAT UNITS REQUIRED PER HOUR TO HEAT 1 CUBIC FOOT OF AIR AT DIFFERENT TEMPERATURES.

Temperature of external air.	Temperature of air in room.				
	50°	60°	70°	80°	90°
	Heat units required per sq. ft. of surface per hour.				
0°.....	1.028	1.234	1.439	1.645	1.851
10°.....	0.805	1.007	1.208	1.409	1.611
20°.....	0.590	0.787	0.984	1.181	1.378
30°.....	0.385	0.578	0.770	0.963	1.155
40°.....	0.188	0.376	0.564	0.752	0 940

degrees which the air is to be raised, divide the product by 190, and the quotient will be the radiating surface required to counteract the cooling effect of the glass. (3) Multiply the square feet of surface in exposed walls, less the square feet of glass, by the number of degrees the air is to be raised and by .25 of a cubic foot of air cooled per square foot of exposed wall, divide by 190, and the quotient is the number of square feet of radiating surface required to supply the heat lost through the walls. (4) Add the three quantities obtained by the foregoing rules and the result will be the total number of square feet of radiating surface necessary to heat the apartment."—*An English rule.*

"(1) Multiply the number of square feet of glass and its equivalent in exposed walls by .9 and the product will be the number of square feet of radiating surface required. (2) Multiply the number of lineal feet of exposed wall by 7 for apartments having a height of 10 feet or under, and for every addition to the height of 2 feet or fraction thereof add 1 or a fraction of 1 to the multiplier (7), divide the product by 3, and the quotient is the number of square feet of radiating surface required. (*a*) For apartments with one wall exposed, or in which the exposed walls do not exceed $\frac{2}{5}$ of all the surrounding walls, add $\frac{1}{5}$ of the exposed wall to the lineal feet and proceed as above stated. (*b*) For entrance halls of rectangular form, multiply the width of the exposed end by the height of the hall and by .7, and the result is the number of square feet of radiating surface required."—*John J. Hogan.*

"Multiply 125 by the difference between the temperature at which the room is to be kept and the temperature of the external air, and divide this product by the difference between the temperature of the pipes or radiating surfaces and the temperature of the room; then the quotient thus obtained, when multiplied by the number of cubic feet of air to be warmed per minute, and this product divided by 190, will give the number of square feet of radiating surface required."—*Hood.*

"(1) Multiply the loss in heat units per square foot of glass per hour for a difference of 1 degree between the external and internal air by the number of degrees difference between the outside air and the temperature of the air in the room and by the square feet of exposed wall, and the product is the loss in heat units through the exposed wall. (2) Multiply the loss in heat units per square foot of glass per hour for a difference of 1 degree between the external and internal air by the number of degrees difference between the outside air and the temperature of the air in the room and by the square feet of glass, and the product is the loss in heat units through the glass. (3) Multiply the contents of the room in cubic feet by 1 for one change of air per hour, by the number of degrees difference between the outside air and the temperature of the air in the room, by the heat units necessary to warm one pound of air 1 degree, by the weight of 1 cubic foot of air at the external temperature, and the product is the number of heat units it is necessary to expend to warm the air in the room to the desired temperature. (4) Add the three preceding products and the result is the total loss in heat units per hour; divide this result by the heat units emitted per hour per square foot of radiating surface, and the quotient will be the number of square feet of radiating surface required."—*John Hopson, Jr.*

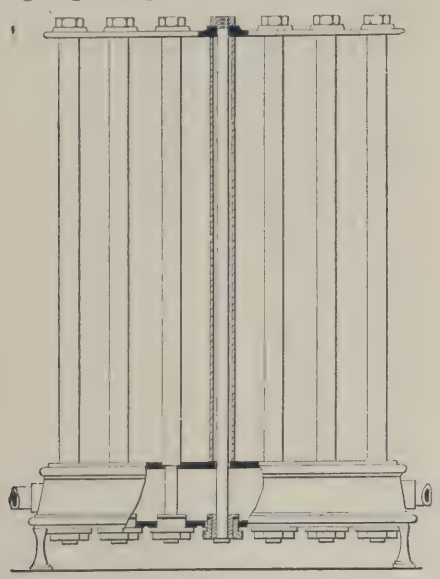
TABLE III.—EMISSION AND ABSORPTION OF HEAT UNITS PER SQUARE FOOT PER HOUR FROM CAST-IRON PIPES OR RADIATORS.

Mean temperature of heated pipe, radiator, etc.	Temperature of air in room.	By contact.		By radiation.	By radiation and contact.	
		Air quiet.	Air moving.		Air quiet	Air moving.
Hot water.....140°	70°	55.51	92.52	59.63	115.14	152.15
" " .....150°	70°	65.45	109.18	69.69	135.14	178.87
" " .....160°	70°	75.68	126.13	80.19	155.87	206.32
" " .....170°	70°	86.18	143.30	91.12	177.30	234.42
" " .....180°	70°	96.93	161.55	102.15	199.43	264.05
" " .....190°	70°	107.90	179.83	114.45	222.35	294.28
" " .....200°	70°	119.13	198.55	127.00	246.13	325.55
" " or Steam 210°	70°	130.49	217.48	139.96	270.49	357.48
Steam .....220°	70°	142.20	237.00	155.27	297.47	392.27
" .....230°	70°	153.95	256.58	169.56	323.51	426.14
" .....240°	70°	165.90	279.83	184.58	350.48	464.41
" .....250°	70°	178.00	296 66	200.18	378.18	496.81
" .....260°	70°	189.90	316.50	214.36	404.26	530.86
" .....270°	70°	202.70	337.83	233.42	436.12	571.25
" .....280°	70°	215.30	358.85	251.21	466.51	610.06
" .....290°	70°	228.55	380.91	267.73	496.28	648.64
" .....300°	70°	240.85	401.41	279.12	519.97	680.53

NEW SPECIALTIES.

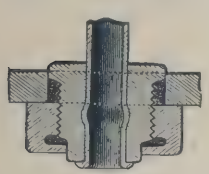
THE ASHLEY RADIATOR.

In this radiator there are double tubes, one inside the other, as shown in the sectional part of the accompanying engraving. The inner pipe is ex-



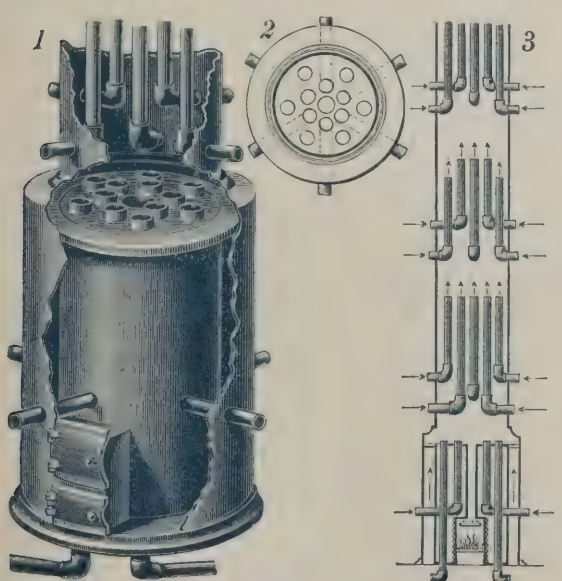
ASHLEY RADIATOR.

panded into a male nut, which is held in place in a diaphragm by a female nut, as shown in the small sectional cut. The outer tubes are held in place in a second diaphragm by setting up the nuts on the upper ends of the inner tubes, as shown. The Ashley Engineering Co., of 136 Liberty street, New York, are the manufacturers.



MACDONALD'S PNEUMATIC VENTILATOR.

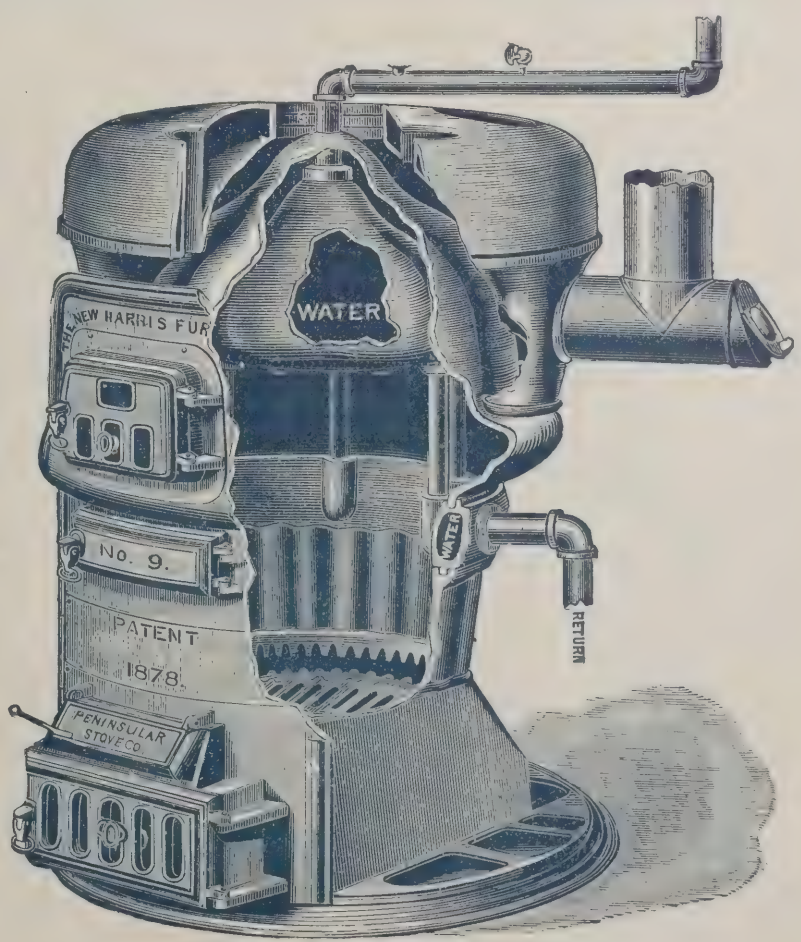
As shown by the engravings this invention consists of a main ventilating flue containing within itself auxiliary vertical tubes, having elbows at right angle connections at various levels forming inlets for the tubes at the sides of the main flue, there being a heater within or contiguous to the main flue. Fig. 1 shows the lower part of such a main flue, provided with a heater and fire-box, Fig. 2 being a plan view, and Fig. 3 a sectional side elevation representing the air inlets as the apparatus would be arranged for the different floors of a building. The lower tubes, from the hot air generator, discharge a powerful upward blast of heated air against and around the tubes projecting into the main flue next above it, the second set of tubes in like manner discharging just below the tubes entering the main flue at a higher level, as shown in Fig. 3, the arrows indicating the direction of the air currents. With this arrangement all air entering the main flue is heated before its discharge into the flue, thus adding to the velocity of the upward current, and creating a draft which forms a most efficient means of ventilation, the inlets for the exhausts being placed where it may be most convenient, or in proximity to any particular location, where it may be most necessary to insure a constant circulation of air. William R. Macdonald, Allegheny, Pa., is the patentee and manufacturer.



MACDONALD'S PNEUMATIC VENTILATOR.

PENINSULAR COMBINATION HEATER.

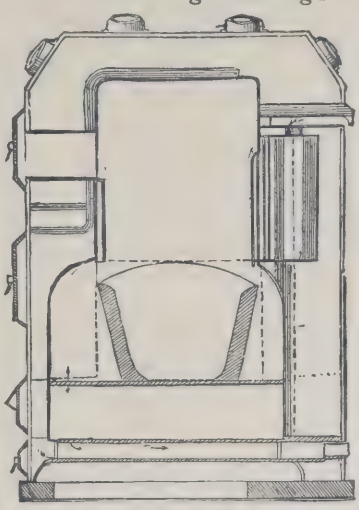
As shown to the right of the accompanying sectional cut, the fire pot of the heater is surrounded by a hollow casting or water ring into which the return water flows through the return pipe shown, and from which the water passes through wrought steel pipes to the reservoir, which is directly over the fire, and so arranged that the products of combustion pass around its entire surface. The reservoir can be readily filled or emptied at will, thereby enabling the furnace to be left idle if necessary during the winter, so as to prevent freezing when the occupants of the building are away for any length of time. The Peninsular Stove Co., of Detroit, Chicago, and Buffalo, are the manufacturers.



PENINSULAR COMBINATION HEATER.

JOHNSTON WARM-AIR FURNACE.

The aim in the construction of the heater shown in the accompanying cut has been to produce a furnace for the economical combustion of soft coal. It is made with a large heating surface,



JOHNSTON WARM-AIR FURNACE.

and is encased in a shell of sheet metal. For the purpose of securing perfect combustion a series of air induction passages extend inward from the casing of the furnace, passing through the air warming chamber and upward on the outside of the combustion chamber into a thin annular chamber within the combustion chamber, where they discharge currents of heated air which passes into the furnace through holes just above the fire pot. Geo. W. Johnston, Farmington, Ill., is the patentee and manufacturer.

UNIVERSAL PIPE HANGER.

The accompanying cuts show clearly the points in which this hanger differs from other hangers now on the market, so that an extended description is unnecessary. It will be noticed that pipes supported by these hangers may be very readily taken down without disturbing the hanger, by simply removing the dovetailed

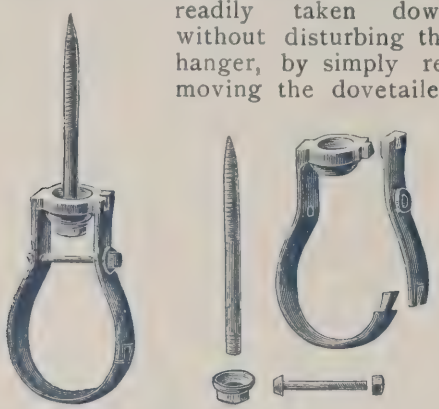
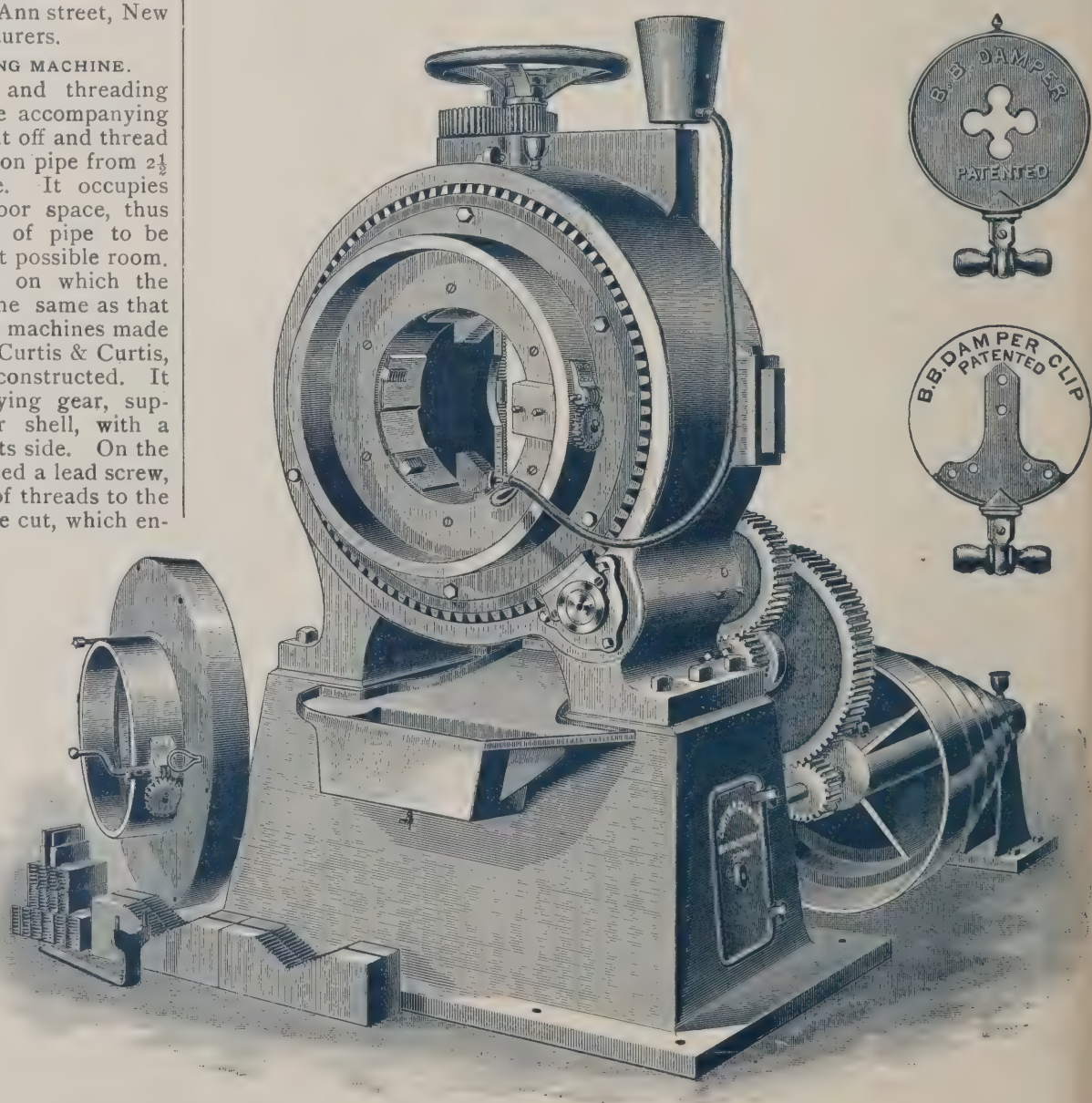


FIG. 1.—UNIVERSAL PIPE HANGER.—FIG. 2.

piece shown to the right of Fig. 2, Fig. 1 showing the parts illustrated by Fig. 2 assembled together. The hanger has free action in all directions, and the holding or tying of pipes while fastening the hanger is obviated. The Evory Mfg. Co., 21–23 Ann street, New York, are the manufacturers.

A NEW PIPE CUTTING MACHINE.

The pipe cutting and threading machine shown in the accompanying cut is arranged to cut off and thread all sizes of wrought iron pipe from 2½ to 12 inches inclusive. It occupies comparatively little floor space, thus enabling long lengths of pipe to be handled in the smallest possible room. The general principle on which the machine is built is the same as that upon which the smaller machines made by the manufacturers, Curtis & Curtis, Bridgeport, Conn., are constructed. It consists of a die-carrying gear, supported in a casing or shell, with a pinion embedded in its side. On the back of the gear is placed a lead screw, of the same number of threads to the inch as the pipe to be cut, which engages with the brass lead blocks shown on the side of the shell, and which work out or in by eccentrics. Thus, as the gear revolves in the shell it is drawn back into the casing by the lead screw and the dies are brought on to the pipe. In operating the machine the pipe is placed through the self-centering vise attached to the back of the machine, with the end to be cut against the back of the dies, and securely clamped by turning the hand wheel shown on top of the machine. The dies are all quick opening and adjustable to any variation of the fittings by means of cams on an annular ring behind the dies, and they are set for the size of pipe to be cut by turning the ring to the corresponding graduation. The difficulties attending so great a range are overcome by using two die-carrying rings or fixtures which fit into the large gear. The large one is shown in the machine, and contains six dies for threading all sizes of pipe from 7 to 12 inches inclusive. The small fixture is shown by the side of the machine, and contains four dies for cutting all sizes of pipe from 2½ to 6 inches inclusive. A change from 2½ to 12 inches is made in a few moments by simply changing the fixture and jaw steels. In cases where the purchaser wishes the machine to cut left hand threads, as well as right, or casing or other thread as well as standard thread, this machine is built with a pressure feed instead of a lead screw. The advantages claimed are that it has unusually large range, requires the minimum of floor space, takes little power, and simplicity and cheapness of construction.



A NEW CURTIS & CURTIS PIPE CUTTING AND THREADING MACHINE.

ZERO VALVE WHEEL HANDLE

The body of the valve wheel shown in the accompanying cut is made of malleable iron, which, in connection with the coiled wire rim, makes it at once light and strong. The heat transmitted from the steam to the wheel is quickly dissipated by radiation from the large surface presented by the coiled wire, so that the wheel is always cool. Besides this it may be easily and firmly grasped, and being nickel plated is very ornamental.



ZERO VALVE WHEEL HANDLE.

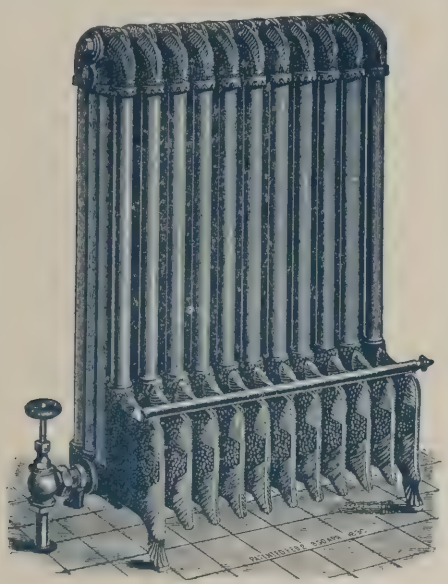
It is manufactured by W. F. Greene, 1931–1937 Sixth avenue, Troy, N. Y.

THE B. B. DAMPER CLIP.

The damper clip illustrated herewith is very simple in construction, consisting practically of two pieces bolted together, clamping a wood handle at one end and the usual damper shaft at the other. The means employed to hold the handle at a given point close up to the pipe in a firm, locked grip on the shaft are such as to be readily applied or quickly removed. Berger Bros., 237 Arch street, Philadelphia, are the manufacturers.

HOME COMFORT RADIATOR.

This radiator is made for steam or hot water, and was especially designed to take the place of an open grate for

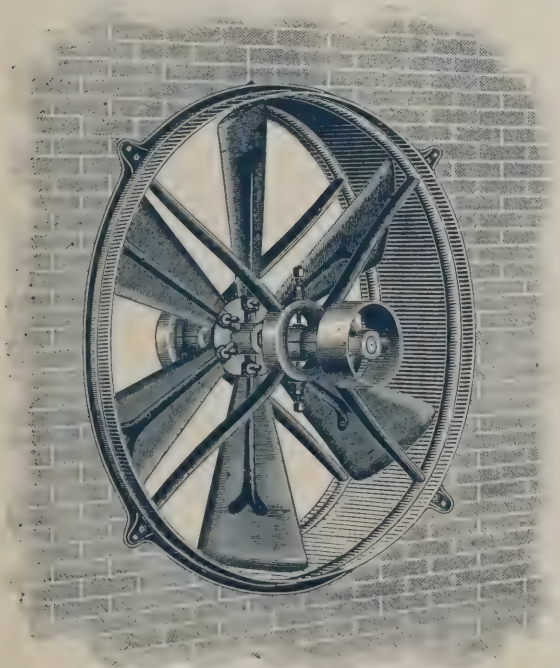


HOME COMFORT RADIATOR.

warming the feet. It consists of a cast-iron base and top into which are screwed four rows of wrought iron pipe, as shown in the accompanying cut. Each section has top and bottom connections, insuring perfect circulation. The end sections are provided with top and bottom openings by means of which the radiator may be used on the under or overhead system of piping. Reuben Westcott of Portland, Me., is the manufacturer.

PERKINS VENTILATING FAN.

The accompanying cut shows an improved wall fan made by B. F. Perkins & Son, Holyoke, Mass. It is of the same design as their regular fan except that the legs are left off and a flange by which it is fastened to the wall put around. The blades of the fan can be adjusted to any angle by loosening the set screws on the hub which pass through



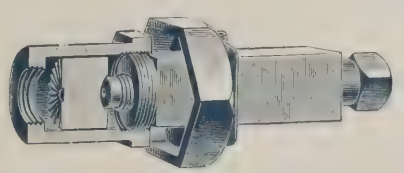
PERKINS VENTILATING FAN.

the arm, so that the capacity of the fan may be increased or decreased. The fan is provided with self-oiling and adjustable bearings, and all parts are interchangeable. The arms of the blades are screwed into the hub, and the set screws being fastened above the thread gives the arm its full strength.

The improved bent blades used are patented, and the manufacturers claim that it will hold the air so that it cannot slip by to the next blade and thereby diminish its capacity.

ASHLEY NIPPLE HOLDER.

The nipple holder shown in the accompanying sectional cuts is manufactured by the Walworth Mfg. Co., 14–24 Oliver street, Boston, Mass. The several sleeves or heads corresponding to the size of the pipe, being interchangeable, are easily screwed on to the shank by hand, when the hexagonal collar, sliding along the square shank, fits over the hexagonal end of the sleeve, securely holding it from turning either way, and taking the strain off the

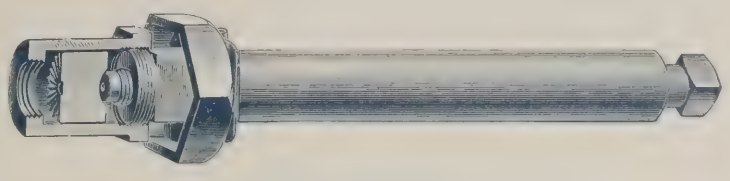


ASHLEY NIPPLE HOLDER.—FIG. 1.

sleeve and shank thread. The piece of pipe to be threaded is screwed into the holder; the teeth on the face of the non-rotary follower within the sleeve, shown in Fig. 1, are forced into contact with the end of the pipe by turning up the follower bolt, which prevents the pipe or nipple from turning in either direction, thus permitting the cutting of right or left hand threads. The holder being placed in a vise, the die is applied in the usual manner. The round end of the holder will enter the head of the die stock, so that the die may be run on until it comes in contact with the end of the holder, if desired, so that the shortest possible nipple required may be cut. The sleeve, follower, and follower bolt are made of the best quality of cast steel, and are carefully fitted. Fig. 2 shows the nipple holder as made for use in pipe machines. In adapting the holder for this work a piece of extra heavy pipe of the length of the machine cylinder is shrunk on to the square shank, extending the follower bolt to correspond. This permits the sleeve and hexagonal collar to project beyond the face of the gripping chuck of the machine, while the head of the follower bolt extends beyond the end of the cylinder. By this arrangement the operator is able to set up and release the nipple or change the sleeves without disturbing the shank of the holder; in fact, in cases where the speed is moderate, these changes can readily be made without stopping the machine.

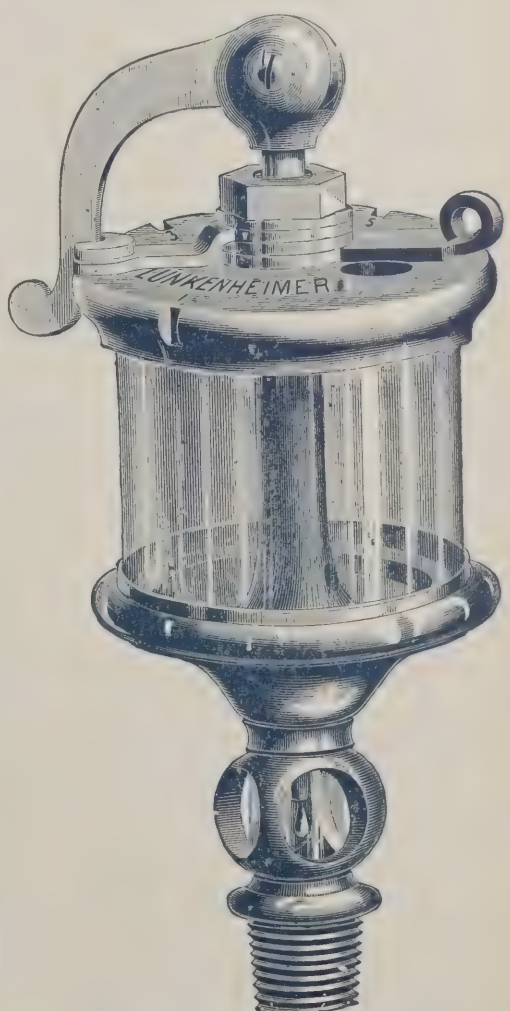
CROWN INDEX SIGHT FEED OIL CUP.

As shown by the accompanying illustration, this cup is provided with an index device for regulating the flow of oil, and an indicator arm turning on the lid to mark the notch giving the desired feed. When desired, the feed can be instantly turned off, and on again, by replacing the index lever in the notch of the indicator arm. When the index arm is closed the lever can be left to stand up out of the notch,



ASHLEY NIPPLE HOLDER.—FIG. 2.

thus acting as an indicator to show from a distance that the feed is shut off. As is often the case where a number of cups require different feeds, especially before starting engine, when an extra amount of oil is wanted, this can easily be accomplished with the Crown without losing the original feed, by simply moving the indicator arm a few notches to the right, and when the established feed is again required it is only necessary to replace the indicator arm in the index slide, which marks the established feed. These cups are all made of cast brass, handsomely finished, and are heavy and durable.



CROWN INDEX SIGHT FEED OIL CUP.

Besides the Crown, seven other styles of oil cups are made by the manufacturers, the Lunkenheimer Company, Cincinnati, O.

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THE sixth annual convention of the Master Steam and Hot Water Fitters' Association will be held at the Broadway Central Hotel, New York, June 19, 1894. See page 22.

MODERN architecture in the use of iron as a material for building is, in many cases, introducing new conditions and problems for heating engineers to consider. For instance, a certain church building is planned and specified to be slate-roofed, and the ceiling is to be of thin corrugated iron. The space between the ceiling and the boards upon which the slates are to be fastened is entirely unoccupied, except by the timber arches upon which the corrugated iron ceiling is fastened and the roof trusses. The roof is of the Gothic order, with four gables, and it exposes an enormous surface to the weather. In such an arrangement the air in the lower part of the space immediately over the ceiling must be heated almost to the same temperature as that in the upper part of the auditorium, and, rising to the inner surface of the roof, must become rapidly chilled there and fall back to become again heated. Thus an active circulation between the cold roof and the warm ceiling will inevitably be created. It is evident that the loss of heat from the roof must be large. Can any heating engineer say exactly what it will be per square foot for any given difference between inner and outer temperature, or even give a safe rule for its approximation ?

AGAIN, a ferry-house is inclosed by walls of boards sheathed exteriorly with corrugated iron. The heating engineer has no precedent to guide him in estimating the amount of radiating surface needed to warm the building, and must make a careful calculation based upon experimental data to determine it with even approximate accuracy. It is now becoming more and more the practice to construct bay-windows of timber frames, exteriorly covered with galvanized iron, except such parts as are occupied by the glass. The resisting power of this kind of construction to the passage of heat is certainly less than that of brick and mortar ; but as yet no data have been made public whereby the increase of loss due to this method can be readily computed. Those who have had experience in heating buildings wherein iron enters largely as a constructive material, might confer a benefit upon the profession by their views upon its relation to amount of radiating surface required.

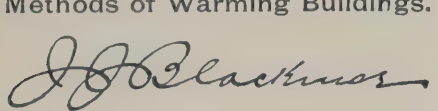
WEATHER in the vicinity of New York, this winter, has been favorable to a certain class of contractors for heating apparatus. The average temperature has not been such as to exact heavy work from any apparatus powerful enough for zero weather. The result may be that some plants put in this year will be found wanting when severe weather comes. Some owners may possibly object to paying in full for heating work on this account, taking the position that it is impossible to know whether heating plants erected for them are satisfactory or not until tested by much more extreme weather than the season has yet brought. This condition of affairs is always embarrassing to worthy and competent contractors who have full confidence in their work ; but it sometimes favors those who desire to cover deficiencies and get full pay for inferior work. There should, however, be no hesitation on the part of owners in paying responsible contractors for work which the latter are willing to guarantee will endure a practical test whenever the weather shall be cold enough to make it.

AMONG the problems presented to heating engineers, which cannot be referred to fixed data, but must continue to depend for solution upon judgment matured by experience, is the apportionment of heating surface to the exigencies of various climatic conditions. For example, the average temperature of winter at the city of Lynchburg, Va., is much higher than the winter temperature of Boston ; yet Lynchburg, during occasional and exceptional periods, experiences as severe cold weather as Boston does during the greater part of winter. The cold snaps in cities lying between, say Philadelphia and Lynchburg, do not last as long as in more northern cities. But even were they less severe than they are, they would be more unendurable, on account of the mild weather intervening, which prevents people from becoming inured to cold. It is manifest that the wider the ranges of winter temperature are, the greater must be the care and judgment employed in estimating and, more particularly, in distributing and regulating the heaters used for warming buildings. With surface sufficient to meet extreme conditions, it must, in order to prove satisfactory, be capable of control in moderate weather.

HOT-WATER heating apparatus has often been spoken of as particularly adapted to meet the wants of extremely cold climates. On this ground it has been very extensively used in Canada, the New England States, Minnesota, and other parts of the Northwest. But we should consider the problem of successfully heating a building by steam, located in any of these regions, as much more easy of solution than to heat by steam a building situated in Atlanta or Charleston It seems to us that hot-water heating apparatus is especially adapted to meet the needs of buildings in places where the average temperature is never very low, yet which are sometimes subject to quite low temperatures lasting through short intervals. It is the only kind of heating apparatus whereby the temperature of apartments at considerable distances from the primary source of heat and warmed by a *single* radiator or register can be regulated to meet the wants of their occupants.

STEAM heating apparatus used in such buildings needs for its successful operation to have a less amount of heating surface than is required in the colder periods ; dependence being placed upon grates to help out the general heating apparatus in such an emergency as may occur perhaps four or five times each winter. Much complaint about overheating has come from steam-heated buildings situated as described, in which the lowest temperatures of their respective localities has been made the basis of estimate for haeting surface.

Methods of Warming Buildings.



I have been reading with much interest the articles in your paper on heating and ventilating of schools, by Fred P. Smith, and on the warming of residences, by "Zero." Both of these gentlemen have given the trade valuable information, and have much enhanced the appreciation accorded to your valuable journal.

In your September number occurs a paragraph in the article by "Zero" that is rather startling to one who has had considerable practical experience as well as some scientific instruction. The paragraph is as follows:

"Concerning the item of fuel, I place direct steam and direct hot water heating on the same plane, if both be equally well done. The usual arguments made to prove hot water cheaper than steam are misleading and are not generally believed by the agents who most strongly urge them. Furnace heating requires slightly more fuel than direct steam or water radiation, but no more than the indirect, just as it is better than the direct forms but not better than the indirect."

This seems a harmless paragraph when one reads it for the first time, but as it is thought over, it becomes much more startling. First, the statement is made that hot water is no more economical in regard to fuel than is low pressure steam. Second, he states that the arguments used to prove this are misleading and not generally believed by the agents who most strongly urge them. Third, that furnace heating requires slightly more fuel than direct steam or water heating, but not more than the indirect of either.

"Zero" very modestly disclaims all knowledge of science, and sticks to his practical experience as a guide. I admit his experience has been of great service, and has enabled him to write good "horse sense," but I cannot allow such statements as the above to go unchallenged, when they are so much at variance with my scientific instruction and practical experience.

In making a statement like this the fact has not been considered of the great difference between the specific heat of water and air, or the absorbing powers of the two elements.

Before heat can be distributed to the several rooms connected with a system, it must be absorbed from the fire by the element used as an agent of distribution, either directly or indirectly.

In the case of a hot air furnace, air is the only agent used, both for the purpose of absorption and for the distribution of the heat. In a direct steam apparatus, water is the element of absorption and steam the agent of distribution. In a direct hot water apparatus, water is the only agent both for absorption and distribution. In an indirect steam apparatus water is the agent of absorption and steam and air the agents of distribution. In an indirect hot water apparatus water is the element of absorption and the agent of distribution to the several stacks, after which air is used as the agent to distribute the heat to the several rooms.

We have then five different methods of utilizing the forces of nature by which we may accomplish the warming or warming and ventilating of the building we may have under consideration. In this article I propose to make a comparison of these different methods, in regard to their operative as well as to their comparative economy. The first comparison will be between hot air and direct steam.

At the outset it is almost necessary to adopt some particular kind or size of furnace as a standard, for some are so poorly made that they use double the fuel that will be used by the best ones to accomplish the same result. As, however, this would not be advisable in an article like this, I will confine myself to the general principles that govern the operation of the two methods.

In absorbing heat from a furnace by air we have to bring the air into contact with its heated surfaces. It is therefore necessary to calculate how much air is necessary to take off a given quantity of heat. The specific heat of air is .238 compared with water at 1. Water, then, has a specific heat, or power to absorb heat, more than four times greater than air, but for the sake of this comparison we will assume that its power is as four to one, that is, one pound of water will absorb as much heat as four pounds of air. The volume of these two elements differ very materially, for one pound of air occupies as much space as eight hundred pounds of water, and when we consider that the specific heat of water is four times greater, it will be seen that we have to bring in contact with the fire surfaces 3,200 cubic feet of air to absorb as much heat as can be taken up by one cubic foot of water.

It is easy to see that one cubic foot of water can be distributed to much better advantage over, or around, the fire surfaces of a steam heater than the 3,200 cubic feet of air can be brought in contact with the surfaces of a furnace.

Heat is generated by the combustion of fuel, and it must be absorbed by the surfaces of the furnace or heater as rapidly as made or it will pass out of the chimney and be wasted. It is also a known fact that heat will be transmitted from the fire to the surfaces in direct proportion to the difference in temperature between the fire and that of the surfaces surrounding it.

These facts are greatly in favor of water surfaces, as the water surfaces can be brought more directly into contact with the fire, and they can be kept at a much lower temperature than surfaces which depend on air for absorbing their heat.

In the first case we can bring one cubic foot of water into contact with the fire by spreading it over not more than six square feet of surface, and yet be able to take up nearly all the heat coming into contact with it; but we could not bring 3,200 cubic feet of air into contact with six feet of surface rapidly enough to take up the heat, without the aid of a powerful blast.

In the second case the surfaces of a hot air furnace are at a much higher temperature than water surfaces, for water rarely rises above 212 degrees, while the surfaces of a hot air furnace may be anywhere from 300 to 1,200 degrees. It will be seen from these statements that the capacity of water surfaces to absorb heat is much above that of air surfaces.

In another article I shall consider the comparative value of the different methods for distribution.

JOSEPH A. MOORE in a paper on the Heating and Ventilation of School houses in Massachusetts says: A large number of examinations by the inspectors has demonstrated that in a room with two cold or exposed sides the best results have been obtained when the bottom of the warm-air inlet was located in the inner, or warm, side about eight feet above the floor and about four feet from the outer or cold side.

In a room with three cold or exposed sides the best results were noticed when the warm air was brought in through two ducts in the inner warm side, eight feet above the floor, but each duct about four feet from an outer wall or cold side.

As this arrangement is not always practicable, on account of the plan of the building, the location of heating apparatus, or cost of construction, it is often the case that first-class results are obtained when but one inlet is provided, located about eight feet above the floor and as nearly as practicable in the center of the warm or inner side of the room. The size and location of the outlets, or foul-air ducts, is of equal importance with that of the inlets. For a fifty-seat schoolroom the outlet duct should have an area of not less than five square feet net, and should be placed at the bottom of the inner side of the room or in the floor at the inner side, if the air is to be taken from the first story down to the bottom of the foul-air shaft in the basement. In a room with two cold or exposed sides, the outlet should be as near the inner or warm angle of the room as possible. In a room with three exposed sides the outlet should be as near the center of the inner or warm side as practicable. This applies equally well whether the warm air is brought in through either one or two inlets located as previously described. Inlets and outlets of the size and location described will be sure to give good circulation. It is desirable that the outflow of air from the room through the outlet should be a little in excess of the amount brought in at the warm-air inlet, the difference being made up by air drawn into the room through cracks and various small openings. By having the outflow slightly in excess of the inflow through the ducts, much better circulation will be obtained, and the heat and fresh air will be used more economically than when the plenum condition exists; that is, where the inflow through the warm-air duct is in excess of the outflow through the foul-air opening.

The Report of Chief Wade of Massachusetts.

The "Annual Report of the District Police of Massachusetts" has for four years been of great interest to all students of improved ventilation. Since the wise compulsory ventilation laws of the Bay State were put into the hands of this department for enforcement, the annual reports of its chief to the Governor have been largely descriptive of the work of ventilation accomplished in the schools of the State. Each report has been a marked improvement upon its predecessor, both in record of the results accomplished and the general tone of the writings. When, at the beginning, the inspectors were compelled to depend upon others for ideas, the annual report was of course largely filled with descriptions of various systems of certain enterprising firms, which gave the document something of an appearance of an advertising medium instead of a state paper. The criticism caused by one report in which a firm was given the privilege of writing its own matter in praise of its own work, as though coming from the department, has perhaps caused the elimination of nearly all such objectionable matter from the report for last year.

There is scarcely a book which is so full of modern methods in ventilation of schools as this one under review. The inspectors who have prepared it have been absorbing ventilation for nearly five years, and their report shows to what purpose. A new feature is found, in the report of an inspector appointed especially for the examination of uninsured steam boilers. His report shows very strongly the need of a higher grade of intelligence in the men who care for these generators of steam power. Though the zealous inspector has undoubtedly swept pretty clean, he has not said nearly all that might well be urged as to the need of better supervision of boilers in schools and factories. The present legislature will undoubtedly place in the hands of Chief Wade the necessary power to compel better protection.

Under the head of ventilation, the chief makes this introduction to the work exhibited:

"The following plans or methods or systems of ventilation, designed by the inspectors detailed for this important work, give useful and practical information on this subject of universal interest. Their long experience and the exceptional opportunities afforded them have given this department facts that are worthy of adoption, and I respectfully call the attention of those interested in the best achievements in the art of ventilation to this portion of my report."

In speaking of the "long experience and *exceptional opportunities* afforded them" the chief pays an indirect, though well-deserved, if somewhat concealed tribute to the practical and scientific men whose long experience has been made use of by the inspectors who have such "exceptional advantages" and opportunities to study and profit by the work of the several firms who have made ventilation the success it is in Massachusetts. For the fact stands that to the trade principally, and to several engineers largely, Massachusetts is indebted for the work done. The inspectors made it possible by compelling action, but the way to act, the methods to follow, the ways to success, came not from the inspectors, but from the men whose work they examined but never directed.

Following this introduction the attention of all who are interested in the "best achievements in the art of ventilation" is called to a description of the plans of several fine buildings, admirably illustrated with very clear and well executed drawings. In the group are shown "An Ideal High School Building;" "The new High-School House at Arlington, Mass.;" "a Four Room School Building;" a "Model School-House, North Adams, Mass.;" and "a Description of a School Building at Springfield and a System of Heating and Ventilation."

In the group one can find the field of ventilation pretty well covered. The advocate of mechanical ventilation will find it carried out to his heart's content in the Ideal High School, the Arlington School, and the Model School at North Adams.

For him who thinks ventilation by non-mechanical systems is possible, there is the example of the Four-Room School and the Springfield School Building.

It is only fair to the student, who would take these plans as a guide, to call his attention to the fact that in speaking thus of these examples as "achievements" the chief has, inadvertently no doubt, made use of an incorrect word.

Nothing is "achieved" until it has "come to an end," is finished or accomplished. "The best laid plans of mice and men" do not always lead to very flattering results. The descriptions are all written with such painstaking in details that the fact that, for the most part, the erection of the buildings shown is not yet accomplished, is omitted.

The demand for the reports of Chief Wade is very great, and the edition is always quickly exhausted. If it were possible for many of the readers of HEATING AND VENTILATION to secure a copy of the document, then further review would be unnecessary for general information. The report of "the best achievements" is worthy of careful consideration from many standpoints. Here we have the apparently independent work of five men, each presenting his idea of the "perfect system" for the building treated. None is hampered by the restrictions of money, space, or practical experience. Each has had five years, nearly, of observation of the work of all who have been designing, inventing, experimenting, and succeeding in the ventilation of Massachusetts schools; and we therefore find, as we naturally expect, that the schemes presented are combinations of the ideas of several individuals, an effort to combine the best points of several systems and thereby evolve the best method.

Where the inspectors have done great good and have been most helpful is in the matter of details of important but minor feature. A simple direction from the department compels the architect and building committee to provide the means which very often would not otherwise be forthcoming. We thus find here many suggestions as to mixing valves, forms of fresh-air inlets, etc., which are as superior to common practice as they are more expensive.

"The Ideal High School Building" was shown in the May number of this journal and there fully described. Should any community ever vote sufficient money to follow this design they would have a good building. The engineer, who studies carefully the plans will doubtless find many things in which he would feel that practice would have to disagree with theory. All the school rooms have inlets and outlets of the same size, while the engineer would probably feel like varying the size according to elevation or distance from the fans. Again, corner rooms with seven windows are given no more heating surface in the radiators than the middle rooms with only four windows, etc.

"The Arlington High School" was shown and described in the August number of this journal. The system will doubtless be quite successful when completed. The "Model School House at North Adams" is worthy as a design of its name, and brings out strongly the advantage to a community of having for a citizen a state inspector who is also an architect and engineer. Not many towns are so favored.

PYNCHON SCHOOL HOUSE, SPRINGFIELD, MASS.

This building is an "achievement," though the system of ventilation described in connection therewith *is not*.

One can scarcely read this portion of the report and not feel that the local inspector who wrote it is somewhat disingenuous. Note some quotations: "This school *is* a two-story building." "It *is* finished in hard-wood;" "The outside walls *are* constructed," etc.; all of which, written in the present tense, *is* true. Now following right along, in the same tense, is found: "The heating *is* by a hot water system, part direct, part indirect radiation;" "Each room *has* a separate hot air chamber;" "Each room will have about 500 feet of radiating surface;" "Each room *has* a separate ventilating shaft 24 by 30 inches;" "The Demarest flushing-rim wash-out water-closet range, with automatic supply tank, *is used*."

Thus as shown by every quotation the reader is told of what *is* in a building which *is*. If the whole thing were ideal and imaginary then there could be no complaint, but the facts are that the building *was built over two years ago*, and that the system of ventilation, warming, and sanitaries is in no case as described. The system of heating *was* and *is* by hot air furnaces, the system of ventilation is not by "separate flues," but by the common-shaft method, and the sanitary system is the dry closet method. If a successful system has been introduced in a building, and used for nearly three years, why should not the firm, in this case the Fuller & Warren Warming and Ventilating Co., have the benefit of the inspector's approval instead of his thus giving an impression that the original system must have been removed and replaced by the one herein described so minutely by "is" and "are?"

This criticism is not made with any intention of charging the inspector with anything more than lack of frankness in not explaining that the system presented was the one he desired to have adopted rather than the one which is in operation.

A REMARKABLE RESULT.

One feature of great interest and very positive value is found in the statistical table of buildings in which ventilation has been introduced since 1888. These figures are given as actual tests and measurements of the department, and form the most complete and extensive series of tests ever made. The tables cover the work in 209 buildings, containing 1,131 school rooms, and accommodating the average attendance of 50,895 pupils. To this large number there has been provided an average supply of 30 cubic feet of fresh air per minute per pupil with the average removal of 33 cubic feet.

The examination of the tables is both instructive and interesting, showing some wide shots from the standard:

Take the following list of ten:

Supply in cu. ft.	Exhaust in cu. ft.
37 per min.....	50 per min.
34 " "	45 " "
31 " "	40 " "
18 " "	36 " "
39 " "	60 " "
33 " "	61 " "
38 " "	47 " "
30 " "	48 " "
20 " "	33 " "
30 " "	46 " "
310	506

The average supply for the ten is thus 31, and the corresponding exhaust is 50, or 38 per cent more than the supply.

An interesting query might be, "How can we extract 71 if only 53 enters"? But the record proves we can.

Or again, take the following five selections:

Supply in cu. ft.	Exhaust.
33 per min.....	21 per min.
50 " "	35 " "
27 " "	17 " "
45 " "	25 " "
35 " "	24 " "
5) 190	5) 122
38	$24\frac{2}{5}$

Here we have a supply of over 50 per cent more than the exhaust. Wonder where the air went to! or will the buildings burst some time from the over-filling?

The plates shown are nearly the same as were issued by the department in the spring. A slight change is found in the fact that the names of the "designers" do not now appear, as they did then, and the appearance of state inspectors as "state engineers" is thereby avoided, a change for the better most assuredly, and one which removes all elements of discord from the relations of the department with the heating engineers and trade.

LETTERS FROM PRACTICAL MEN.

Correspondence from practical men upon topics of interest relating to Heating, Ventilating, and kindred subjects, will find a place in this department. The editors, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

Relative Merits of the Open and Closed System of Hot Water Heating.

I have received many inquiries asking the relative merits of the closed and open system for hot water heating, and as authorities differ on this question, I should like to have the opinion of some of your practical readers who may have considered the matter.

INQUIRER.

An Evil Guaranty.

Many manufacturers of boilers and contracting fitters are justly indignant at this time of the year because they cannot collect the money for their boilers, which have been in use doing good work all the season, on account of the fact that in the contract for the purchase of the boilers the consumer has been guaranteed a temperature of 70 degrees in zero weather. This guaranty has been rendered necessary by sharp competition, but as there are very few zero days during the winter in our Eastern States, its evil effects are at once apparent.

The remedy for this evil would be that a standard of temperature, higher than that called for by the present guaranty, should be established, so that if the thermometer reaches two degrees above zero there may be no excuse for non-payment. I should like to have the views of the many readers of HEATING AND VENTILATION on this subject, and would ask that every practical fitter, manufacturer, or other person interested, write to this journal promptly, as I consider the question a most important one. C. W.

Size and Rating of Boilers.

With regard to the explanation which is called for in your January issue, I would say that it is perhaps as easily arrived at through the consideration of the statement which is made by "A. C. E." as in any other way.

Hesays, "Practically speaking, one square foot of fire surface will carry twice the amount of water radiation as it will steam." This is undoubtedly true, but I am of the opinion that it would be true only under certain conditions, and those conditions would be when the temperature at which the water radiation was carried was in such proportion to the temperature of the steam radiation as to permit of this relation. Otherwise we are arguing that there is something intrinsically warm besides the fire in the water apparatus, which is of itself able to contribute heat to the system. It is equally true, for the same reasons, that one square foot of fire surface will carry three or four times as much water radiation as it will steam. It must be remarked here, however, that in my opinion neither square feet of fire surface nor square feet of water radiation supplied is a fair basis for computing the capacity of a boiler. Square feet of fire surface fails as a fair basis of comparison simply on the ground that the amount of heat absorbed by each foot depends on conditions which are variable. Square feet of water radiation is no definite statement of a boiler's capacity unless the temperature at which that water radiation is to be maintained is mentioned. For instance, referring to the first quoted remark of "A. C. E." one square foot of fire surface will carry twice as much water radiation as it will steam, there is no temperature given at which the water radiation is to be carried. It is to be doubted whether a square foot of fire surface would carry twice the amount of radiation at 212 degrees as it would steam. All the heat which is in the apparatus comes from the fire originally. The warming of any given space under given conditions to a given temperature calls for a certain amount of heat, whether you warm the given space with steam or water radiation.

Perhaps the matter could be made a little plainer and brought more quickly to a clear understanding if "A. C. E." would explain why one square foot of fire surface will carry twice as much water radiation as it will steam. It is possible that our friend is relying too strongly on the water ratings of boilers compared with fire surface as they appear in the manufacturers' catalogues, and in such case he could hardly fail but go astray, since this source of information would afford him very indefinite and uncertain information. The water rating is all right if you know the rest of the story, but standing alone without further consideration it tells you nothing.

I should be pleased to hear further from 'A. C. E." in this matter if my explanation has not been sufficiently explicit. KNIGHT.

The Flue versus the Loop.

In an article by Mr. Knight in your January issue, entitled the "Proper Standard of Hot Water Radiators," I find the following: "About one-third of all the heat given off by a direct radiator is given off by radiation." Will Mr. Knight please give us the infallible rule by which he determines this proposition? What of the other two-thirds? Who, enjoying the comforts of a steam or hot water radiator on a cold night, can say this is convected heat or that it is radiant? It strikes me that heated rays are all to a greater or less degree convected or conveyed upward with greater or less velocity. If there is a difference between convected and radiant heat, what becomes of the latter when radiators are boxed, discharging the heated air through a register? Is the radiant heat lost, or does it reinforce the currents of convected heat? If the former hypothesis be true, is it not strange that in spite of this one-third loss of radiant heat, engineers and fitters are oblivious to the fact, and are still disposed to use indirect radiation? If the latter hypothesis be true, where is the potency of the argument against flue radiators?

After Mr. Knight's remarkable statement with regard to radiated heat, he further says: "This being so, it can be readily seen how important it is that all surface possible should be so arranged as to permit the freest radiation." In this very sensible conclusion, I heartily concur.

Mr. Knight is evidently ignorant of the very important fact—that in the tests referred to the vertical flue was the only radiator that fully met these conditions. That while in most cases the loops of the competing radiators were in such close proximity as to absolutely preclude the possibility of either free radiation or convection from nearly half their surfaces, every inch of the vertical flue was unobstructed and active surface, "so arranged as to permit the freest radiation of heat." As to the tests conducted in midsummer in a garret or loft with a half dozen so-called Association radiators, all pitted against the vertical flue, determined to down it if possible, under conditions that precluded the possibility of any degree of accuracy, still we find it published that the test of five so-called Association radiators, averaging 70⅝ feet commercial rating versus vertical flue rated at 70 feet, resulted as follows:

"Average temperature at the partitions between the compartments near the floor.

Association radiators.....84.81 degrees.
Vertical flue radiator.....85.13 "

Average temperature near the top of the partitions between the compartments, determined from thermometers located at the end of the partitions:

Association radiators.....89.03 degrees.
Vertical flue radiators.....89.05 "

Compared with the so-called Association radiators, it is claimed that the vertical flue was 33.7 per cent short in condensing. Think of it,—by their own showing, if the test was to demonstrate relative heating power, this flue radiator with a less surface raised the temperature perceptibly higher than its larger rivals. I have always regarded this so-called test as too transparent and worthless to demand any comment. Equally worthless are the conclusions which follow. Flue radiators continue to be sold in the markets of the world in increasingly large numbers and at better prices than their rivals.

The decided preference recently given to the flue radiators by New York architects and mechanical engineers has been phenomenal, they having been selected for many of the prominent buildings of which New York is justly proud. Besides, if anything could furnish a comp ete vindication of the flue and refutation of the conclusions above referred to, it would be in the fact that the flue has so grown in favor that it now has a prominent place in the catalogues of the very manufacturers who sought, by such unfair means, to overthrow it. The reverse side of the picture has been shown by a series of competitive tests, fairly conducted, by L. M. Hunter of Titusville, Pa., and sworn to by him. These tests were conducted during the months of December and January, 1891 and 1892. Any one can obtain copies of the tests by application to Mr. Hunter.

In a properly and intelligently constructed flue radiator all the hot air flues will be ample in size, affording as little obstruction to the free passage of air as is practicable, and with free openings at both top and bottom of the radiator. In a radiator of this construction, the flues will be found of vastly more value and importance than the exterior or so-called radiating surface. The air enters the flues at the bottom of the radiator and ascends with constantly accelerating velocity to the point of discharge. Whether the ascending column is heated by convection or radiation is a matter of small moment. As with a fan, radiating surface is rendered more active and efficient, in precisely the same manner the flue accelerates the action of the radiator, making all the surface vastly more active. It follows, then, that the flue radiator will act much more powerfully in extreme cold than in warm weather. For example: Air entering the flue at the zero point and discharged at, say, 140 degrees F. will pass much more rapidly and in far greater volume than if entering the flue at 80 degrees.

This obvious truth goes far to show the unfairness and worthlessness of the so-called Association test in a New York loft in midsummer. T. C. J.

Evans Exhaust Hot Water Heating System.

I was sorry to read in your issue of December 15 under Letters from Practical Men, the criticism from Mr. I. H. Babcock on the Evans hot water heating system. Under this heading one would naturally expect to find a subject of this character treated with that knowledge and impartiality which are usually displayed when an engineering problem is discussed and criticised. Some of the statements made are, however, very much out of date, even more so than the "lumbering stage coach," which is so "aptly" brought into comparison.

It is evident that Mr. Babcock is unfamiliar with the system which he attempts to criticise, or he would never compare it with the Boston system—the failure of which he seems to charge to Mr. J. H. Vail. For Mr. Babcock's benefit I will simply say that Mr. Theodore N. Vail, of the Bell Telephone Co., who promoted the Boston hot water scheme, and Mr. J. H. Vail, M.E., are as individually different as the Evans exhaust hot water heating system is different from the Prall system. Mr. Babcock implies by his statements that back pressure on an engine does not create a retarding effect on the live steam side of the piston, nor reduce the economy, and therefore does not materially add to the expense of the coal consumption. He also asserts that it requires no forcing pressure to send steam through a long line of underground pipes. Then why use back pressure at all?

Subjects of this character are too generally understood by engineers to need further comments here.

It is not my intention to criticise any heat-

ing system, but a few facts in reference to supplying steam from a central station for the purpose of heating buildings would, it seems to me, be in order. The New York Steam Company's plant is undoubtedly the best equipped plant in existence; still it is not on record as a dividend paying concern; and I believe the same can be said of similar plants in New Haven, Conn., Springfield, Mass., and Williamsport, Pa.

It is the opinion of the writer that live steam can only be supplied with profit from a central station when under most favorable conditions.

Much time and money have been expended to gain experience and to separate theories from practical operating conditions. One result of this has been the development of the Evans exhaust hot water heating system, by which the highest economy may be obtained through absorbing the heat from the exhaust steam, storing it in water, and transmitting the same by means of pipes to the buildings to be heated. It must be admitted that water will absorb a great amount of heat in a shorter time than any other substance available for this purpose. It will also retain this heat with greater tenacity, and to this adaptability of the water for heat and storage purposes the utility and economy of the Evans system is largely due.

As to the power necessary to force this water through the pipes, it will rarely, if ever, exceed a head of 20 feet. On account of the perfect circulation attained, the heat distribution becomes a certainty.

The Evans system has another point in its favor, which should not go unnoticed. Owing to the uniform temperature which is maintained throughout the heating system, extremes of expansion and contraction in the pipes are avoided; consequently very few repairs are necessary, as compared with steam pipes, the temperatures of which vary greatly.

Among the buildings equipped with this system are those of the Scoville Manufacturing Co., of Waterbury, Conn. (10 in number), covering an area of some twenty acres, where a low service pump is used, having two 6-inch steam cylinders, two 8½ inch water plungers, all of 10 inches stroke, and working under a steam pressure of 50 pounds at the pump. The amount of power necessary for this purpose is therefore very small, the exhaust from the pump being also utilized in the system.

Conditions might exist under which exhaust steam could be economically used to do a limited amount of heating, assuming that it be in close proximity to the engine; but, owing to the intermittent requirements in the heating system, it is difficult to understand how this could be advantageously accomplished, when the exhaust steam has to be forced through long lines of pipe, necessitating a great variation of the back pressure on the engine.

Moreover it should be borne in mind that the waters of condensation contain a considerable amount of heat which is necessarily wasted, since it is not practicable to return this water to the boilers.

An elaborate system of return pipes was provided in the New York Steam Company's plant, all of which have been abandoned, as it was found more economical to waste the condensation than to return it to the source whence it came.

It is very generally admitted that there are frequently more ways than one of bringing about a result; and so it is with the distribution of heat contained in the exhaust steam. It is my opinion that capital is quite as safe when invested in the Evans system as in that of the Holly; and what is better, capital has already invested in several instances, and is entirely satisfied with the results obtained.

I am glad to be able to disabuse Mr. Babcock's mind as to the blossoming of the old Prall into the new Evans exhaust hot water heating system. I can also assure him that he will not be called upon "to build the steam ovens," or to "cart the hot bricks around to the houses," on account of the failure of this system to do the work, even without "lifting itself by its boot straps."

THEO. C. IVES, C. E.

NEWS AND NOTES.

New York City.

The architects seem to have plenty of orders on hand. Indications are favorable for a lively building trade in the spring.

The board of education is to build a four-story brick school building, 55 by 89 feet, at 296 and 298 Rivington street, to cost $55,000.

After May 1 the American Tract Society building, Nassau and Spruce streets, is to be torn down. On it is to be erected an eighteen-story office building.

The United Presbyterian societies are to erect a building, to cost $1,000,000, at 5th avenue and 20th street. A large addition is to be made to the Hotel Savoy, at 5th avenue and 59th street. At 58th street and 5th avenue a sixteen-story apartment house is to be erected. A large addition is being made to the Buckingham Hotel, on 5th avenue near 50th street. Another large apartment house is to be erected on the Boulevard at 72d street.

On West 54th street a new court house is to be built. The Tilden Library on Bryant Park and Scribner's new building on the site of the Hotel Glenham, 5th avenue, may also add to the possibilities; while on Washington square a handsome office building is to take the place of the old University. Mercantile structures will occupy the site of the New York hotel on Broadway.

A hotel is expected to occupy the site of the Cyclorama at 4th avenue and E. 19th street, and the American Surety Company will erect an office building at Pine street and Broadway. The Clearing House building on Pine street will also cost about $500,000, and three new cable houses uptown are to be constru ted.

The executors of the estate of Henrietta Constable, 9 East 83d street, are to build a 14-story brick office building, 100 by 200 feet, on the north-east corner of 5th avenue and 18th street, to cost $75,000. William Schickel & Co., are the architects.

Messrs. Weideman of 124 Ludlow street and Rosenbaum of 199 Orchard street are to build a 5-story brick tenement and store, 25 by 96 feet, on the north-east corner of 111th street and 7th avenue. It will cost $30,000, and Samuel Sass is the architect.

Lewis Z. Bach, of 120 E. 82d street, will erect a 5-story brick flat 29 by 102 feet, on the south-east corner of Lexington avenue and 103d street, to cost $35,000. John M. Kumbel is the architect.

John T. Williams of 817 Madison avenue will put up a 7-story brick store building, 46 by 92 feet, at 394 and 396 Bowery, to cost $30,000.

Four 3-story brick dwellings, 20 by 55 feet, are to be built by Susan Orcutt of 416 West 149th street, on the north side of 148th street, east of Convent avenue, C. Steinmetz being the architect.

A $30,000 brick flat and store, 25 by 98 feet, five stories high, is to be built on the north-west corner of 3d avenue and 94th street by Solomon Mehrbach of 74 East 54th street. James W. Cole is the architect.

The plans for the erection of buildings on East Fourteenth street for the corporation of Grace Church have been at the Building Department. They provide for a one-story brick church to cost $9,000; a four-story brick hospital, $50,000; three-story brick school building, $90.000, and a four-story brick dwelling, $20,000; total, $109,000. Barney & Chapman are the architects.

Two five-story brick flats and stores, 25 by 86, are to be built on the west side of 9th avenue north of 56th street, by Andrew Ewald, at a cost of $36,000. James W. Cole being the architect.

A ten-story brick office building will be put up at 704 and 706 Broadway, at a cost of $150,000, by Adolph Boskowitz of 281 Fifth avenue.

George Hornberger of 67 Seventh street, will put up a five-story brick flat building at 126 East 4th street.

Two five-story brick flat buildings are to be erected at 8th avenue and 114th street by Thomas K. Lemon of Bedford Park, at a cost of $40,000.

The Clearing House Association are taking steps to erect a magnificent building on their property on Cedar street between Nassau and Broadway. Particular attention will be given to vault accommodation.

Herman Mann, 92 Eighth avenue, has filed plans for a six-story brick store building at 313 West 15th street, to cost $20,000. A. C. Jackson is the architect.

Plans and specifications have been approved for the erection of a six-story brick store and factory, 27 by 65 feet, at 235 to 239 William street, corner of Duane, to cost $25,000. Sherman B. Townsend of 108 Pierpont street, Brooklyn, is the owner, and John B. Snook & Sons are the architects.

Joseph J. Little and the New York Realty Company will erect an eight-story building, to cost $300,000, at Nos. 473 and 475 Broadway and Nos. 46 and 48 Mercer street. On Nov. 28 the Realty Company bought No. 475 Broadway and No. 48 Mercer street at auction, paying $131,000.

R. W. Gibson's plans for the new Coffee Exchange Building at Nos. 66 to 70 Beaver and Nos. 112 to 117 Pearl street, calling for a nine-story structure, with fronts of granite, buff brick and terra cotta and architecture in the Romanesque design, and not to cost more than $225,000, have been accepted. The building must be completed by May 1, 1895.

C. G. Judson is to build, from plans by Clarence True, eight four-story houses on the northeast corner of West End avenue and 100th street. The fronts will be of white limestone. The improvement will cost about $135,000.

F. A. Squire is to build, from plans by Architect True, five houses on 89th street between West End avenue and the Boulevard. They will be American basement houses with mansard stone fronts and will cost about $16,000 each.

Mrs. Josephine Schmid is to erect, from plans by Richard M. Hunt, a four-story dwelling at the corner of Fifth avenue and 62d street. The lot is 25 by 100, and was bought by Mrs. Schmid last spring for $160,000.

John McLaughlin is to build, from plans by John Hauser, six five-story tenement houses, with stores, to cost $102,000, on the south side of 94th street east of Second avenue.

Bids have been received for the construction of an armory for Troop A, at 94th street and Madison avenue.

Miss Helen Gould, daughter of the late Jay Gould, is making arrangements for the erection at Roxbury, Delaware county, of a large brick building, to be used as a school or home for the friendless.

Philadelphia.

W. A. Margirum, who has built a great number of houses in the downtown section of the city, has planned to erect fourteen two-story dwellings. These houses will be of various dimensions and will be located on the west side of Twenty-sixth street, south of Redwood.

Weekey, Dode & Noble have arranged to construct fifteen two-story dwellings in West Philadelphia. They will all be of brick. Two will measure 17.6 by 50 feet and are to cost $5,000 each. The others, thirteen, will be 15 by 44 feet each and are to cost, collectively, $50,000. The location is Fiftieth street and Paschall avenue.

The building inspectors have examined the plans for the Woodland apartment house on Chestnut street west of Thirty-third. This building will be constructed of stone. It will be seven stories high. It will have a frontage on Chestnut street of 156 feet, and on Woodlands avenue of 100 feet.

Harry Weekey will shortly begin the construction of fifteen three-story dwellings in Germantown.

John Loughran has taken out a permit for the erect on of eighty-five two-story houses on Colorado and Bouvier streets, north of Huntingdon street.

Down in the Thirty-sixth ward, on both sides of Mifflin street, west of Eighteenth, T. F. Gallagher will build 30 two-story brick dwellings. The houses will each be 15 by 42 feet, and will contain all the modern improvements.

Thomas J. Henry has secured a permit to erect eight two story brick dwellings, 14 by 42 feet each, on the east side of Twenty-fourth street, south of Federal.

Pennock Brothers will begin at once the erection of an eight-story office building, at 1031 and 1033 Chestnut street. The structure will be of brick, stone and iron, 39 by 128 feet, and will cost $125,000.

Plans have been prepared for all the power-houses which are to be erected by the various passenger railway companies which contemplate the use of electricity to run the rolling stock. The Electric Traction Company has asked for bids for the construction of one of these buildings at Eleventh street and Susquehanna avenue.

A Philadelphia workingmen's home will be built upon the estate of Emperor William of Germany, after plans furnished him by William T. B. Roberts. An architect and engineer belonging to the German corps examined the model house at Chicago, and, upon returning to Germany, submitted a detailed description of the dwelling to the head of his department, who brought it to the attention of Emperor William, who directed that the necessary plans be secured and that a house be built after them on his estate. The drawings have been forwarded.

Plans have been drawn and bids invited for the new buildings of the Polyclinic hospital, to be erected adjoining the hospital, on Lombard street, west of Eighteenth. The sum of $50,000 appropriated by the legislature for the purpose, will be expended, of which amount $35,000 is the estimated cost of the buildings, and $15,000 for furnishings. The new buildings will be erected upon the Naudain street front, and will be connected with the present structure. They will contain laboratories, rooms for patients, dormitories for nurses, an accident receiving ward, lecture and operating theatre and several extra clinic and dispensary rooms.

John C. Gallagher will build eighteen two-story dwellings on the north side of Dudley street west of Eighteenth.

The committee which has charge of the construction of the Bourse have decided to add an additional story making the building a nine-story one instead of eight.

J. B. Vanderslice is excavating cellars for twenty-five two-story brick houses, at Sixth and Tioga streets.

Plans have been prepared for Messrs. Rhoads Bros., for the construction of 128 two-story dwellings on both sides of Opal street, north of York.

Isaac Bleim has broken ground on the east and west sides of Thirty-one and One-half street, north of Berks, for the erection of 130 two-story dwellings.

Permission has been granted by the Bureau of Building Inspectors to W. A. Margirum for the erection of eleven two-story dwellings of Oakford street, west of Twenty-sixth.

James & Charles A. Maguire have perfected plans and will soon commence work on 44 dwellings, at Leamy street and Lehigh avenue, Thirty-third ward. The houses will all be of brick and brownstone. Nineteen will be on the north side of Lehigh avenue, east of Leamy street, twenty-one on the north and south sides of Steiner street, east of Leamy, and four on the east side of Leamy street, north of Steiner.

Chicago.

Simeon B. Eisendrath has completed plans for an apartment building on Thirty-seventh street and Rhodes avenue for S. Mandel, to cost $22,000. The structure will consist of basement and four stories, cover 66 by 60 feet, have facades of buff Bedford stone with ornamental iron balconies, and will be provided with modern conveniences throughout.

Plans and specifications for a public school building on Augusta and Noble streets have been completed by August Fiedler, the architect of the board of education, and proposals will be received by John A. Guilford, business manager of the board. The structure will consist of three stories and basement, with exterior of stone and pressed brick and slate roof. The interior is to contain the latest improvements for school buildings, and it is to have sixteen class rooms and a large assembly hall. The improvement will cost $65,000.

Lamson & Newman are taking figures on an apartment-house at 1100 and 1102 Washington boulevard for Mrs. Sara S. Potter. The structure will be basement and three stories, 36 by 74 feet, with front of Bedford stone, hard wood interior, and will cost $25,000.

M. A. Hageman will build five three and two story residences at 4909-17 Forrestville avenue. They will cover a ground space of 100 by 76 feet. Stone and brick will compose the outer walls, the interior will have hard wood work and all modern conveniences. Total cost, $35,000.

Among improvements for which plans are reported by E. A. Blondin is a three-story and basement flat building, 65 by 50 feet, with stone and brick exterior, to be erected at 550 and 554 Forty-ninth street, for A. M. Andrews, at a cost of $21,000.

Patton & Fisher have designed a fine apartment house, which J. C. Griffin will build at Indiana avenue and Forty-eighth street at a cost of $40,000. It will be four stories high, 46 by 160 feet. The exterior will be constructed of light colored brick, with cut stone trimmings. The interior will be finished in hard wood, and it will be heated by steam.

A. G. Feree has planned for C. B. McLachlin a three-story and basement apartment house, 40 by 85 feet, to be built at the northwest corner of Wright and Sixty-fifth streets. It will be constructed of brick and Graham pressed stone. The interior will be divided into twelve flats of three and four rooms each and will be finished in hard wood and heated by steam. It will cost $25,000. He has also planned a three-story flat building, 45 by 103 feet, to be erected at the northeast corner of Honore and Seventieth streets. It will be constructed of pressed brick and will cost $20,000.

Jenney & Mundie have let contracts for a handsome apartment-house on Aldine street, near Evanston avenue, Lake View, for J. J. Monaghan. The building will be three stories and basement, with cut stone facade, hard wood interior finish, and all modern improvements. It will cost about $40,000.

Henry V. Pierpont, of the Chicago Rattan and Reed Works, is about to build an apartment-house at 1801 to 1809 Barry avenue, corner of Evanston avenue, for himself. It will cover 100 by 80 feet, four stories and basement, be constructed of stone and brick, finished in hard woods and provided with the latest improvements, at a cost of about $65,000.

A big warehouse is to be erected at Wentworth avenue and Twenty-eighth street for Scott, Jones & Co., at a cost of $30,000.

John Addison has designed extensive alterations and repairs to the Brunswick Hotel building, located on the northwest corner of Michigan avenue and Adams street. The cost will be about $20,000

A. Newell will build five three-story and basement flat houses at 267–73 Lincoln avenue, size 100 by 50 feet, stone and pressed brick exteriors, hard wood interior, and other first-class improvements. Total cost, $50 000.

Four flat buildings are to be erected on Vincennes avenue, near Kenwood place, by Corse & Jeffrey, who will expend about $45,000 on the improvement. The plans prepared by Snyder & Nothnagel provide for a row of buildings three stories and basement high, 100 by 63 feet in size, with stone fronts and hard wood interior.

E. M. Newman has prepared plans for an apartment building on Seventy-third street and Madison avenue for C. F. Gardner. It will be three stories and basement, 49 by 56 feet, with stone for the first story and pressed brick above, and the interior is to be finished in the best style of modern apartment buildings. About $27,000 will be expended on the improvement.

An important improvement is soon to be made at 857 and 859 West North avenue, where O. Knudsen will erect a big structure to be known as the Viking Block, which is to contain stores, offices and apartments. The owner, who has put up several good buildings in the same locality, will expend about $40,000 upon this improvement. The structure will cover 49 by 128 feet and the interior is to be finished in high style, with marble wainscoating and be provided with the latest improvements.

R. S. Peale has bought the triangular piece of ground bounded by Ashland boulevard, Monroe street and Ogden avenue and will improve it with a four-story brick and stone apartment building, to cost $50,000.

E. D. Robbins has prepared plans for a theater, office and hall building, to be erected at Henderson, Ky., for the Pythian Building Association. The building will cost, $80,000.

Ostling Bros. have prepared plans for a handsome apartment building to be erected on Garfield avenue, near Sedgwick street, for O. Vider. It will be four stories and basement high, 48 by 78 feet, have a front of stone and pressed brick, hard-wood finish, and the latest improvements, at a cost of about $50,000.

Work on reconstruction of the First Regiment Armory at Michigan avenue and Sixteenth street will be commenced at an early date. The building will represent an outlay of about $125,000, and will front 170 feet on Michigan avenue and 165 feet on Sixteenth street.

A religious institute to cost $70,000 is in course of erection at the southwest corner of Chicago avenue and Snell street. The foundation is already in and work has been commenced on the exterior walls. The building is to be of steel construction, three stories and basement high, and modern in every respect. It was designed by Architects Faber & Pagels.

I. K. and A. B. Pond have completed the plans for converting the temporary building of the Newberry Library, at the northwest corner of Oak and State streets, into an apartment building at a cost of about $65,000. The building will be heated by steam.

S. V. Shipman has designed for Joseph H. Andrews a six-story and basement warehouse, to be built at No. 389 Wabash avenue. It will cost $40,000.

Fry & Cunningham have prepared plans for an apartment building to be erected on Indiana avenue near Forty-fourth street for Giles Hubbard. It will be three stories and basement high, 50 by 80 feet, with front of granite and pressed brick, finished in hard woods and modern improvements, at a cost of $22,000

A. Druiding has prepared plans for a fine Catholic church and forwarded them to Harrettsville, Noble county, Ohio, where it is to be built. It will have furnace heat. The cost is estimated at $30,000.

Perley Hale has completed the plans for two large apartment-houses which Joseph C. Beifeld proposes to build on Cottage Grove avenue, near Thirty-seventh street. They will be divided into forty-eight flats and four stores, the interiors being finished in hard wood and heated by steam. The cost is estimated at $120,000

A very handsome natatorium building is to be erected on Wells street, near Division, for L. J. Kadish. The plans, prepared by J. W. Ackerman, provide for a three-story and basement structure of stone and pressed brick and roof partly of glass. About $40,000 will be expended in the enterprise.

Building permits issued recently included among other structures two for the state, the Industrial Home for the Blind and a factory in conneetion therewith, both four-story buildings, to be erected at 881 to 883 and 863 to 871 Douglas boulevard, after plans by Mayo & Curry. The total cost of both structures is given at $50,000.

Frederick H. Winston has had plans prepared for a fine new apartment house at 377 to 383 Superior street, immediately east of his own home. It will be six stories high and will have a frontage of 100 feet and a depth of eighty-five. It will be fire proof throughout and will be equipped with all the appliances for comfort and convenience known to the day. The cost of the building is estimated at $100,000.

The Northwestern Yeast Co. are to erect a $50,000 brick factory on Ashland avenue and Bloomingdale road.

BUSINESS AND PERSONAL NOTES.

W. A. Russell is now consulting engineer of the American Boiler Co., 94 Centre street, New York.

The Smith & Winchester Co., of Boston, expect to have the first six sizes of their heater ready to deliver by May 1.

Hazen Mooers, the senior partner of the firm of H. Mooers & Co , of Milwaukee, died at his residence, that city, on Feb. 3d.

The A. J. Lindemann & Hoverson Co., of Milwaukee, have issued a new price list of gasoline stoves, ovens, etc.

The Chicago office of Wells & Newton will be removed from the 11th story to the ground floor of the Monadnock Block.

The Armstrong Mfg. Co., of Bridgeport, Conn., have removed their New York office from 242 Canal street to 139–143 Centre street.

The Thatcher Furnace Co. will shortly remove their New York office to 240 Water street, where they occupy the whole building.

Geo. Esterbrook, the well-known heating engineer of Springfield, Mass., will leave on a six weeks' trip for the Windward Islands the last of February.

The Lunkenheimer Co., of Cincinnati, are sending out a new folder entitled, Up to Date, which describes in detail all the latest "Lunken" specialties.

Henry E. James will continue the business of James & Kirtland, Beekman street, this city, under the old name, no change being made upon the retirement of Herbert James.

McMahan & Taylor, 42 Cliff street, New York, have issued a new catalogue of 200 pages. They have just closed their first year of business with gratifying results considering the unusual times.

The Smith & Anthony Co., of 48 Union street, Boston, have just issued catalogue "B" of Sanitas plumbing appliances, with new price lists, superseding all others. If interested send for one.

The new officers of the Yeager & Hunter Stove Mfg. Co., of Spring City, Pa., are: James G. Yeagers, president; F M. Hunter, vice-president; J. Elwood Yeager, secretary; and J. E. Yeager, treasurer.

The H. B. Smith Co., of Westfield, Mass., have adopted a code of whistle signals to call any official of their company from any part of their works, whenever desired. It is a very satisfactory arrangement.

The following are the officers of the Fuller & Warren Warming & Ventilating Co., elected at a late annual meeting: president, G. C. Wolfe; vice-president and general manager, W. F. Wolfe; secretary, Wm. Henry Warren; treasurer, Joseph Mackay.

The Jower Steam Heating Co., of Brooklyn, N. Y., has been incorporated with a capital of $20,000. The board of directors is composed as follows: Charles Jower, Wm. H. Jower, Marie Jower, Louise M. Helmla, and Frank J. Helmla, all of Brooklyn.

The Gurney Hot Water Heater Co., of Boston, have just issued a new greenhouse catalogue with full description of their boilers both for anthracite and bituminous coal. The catalogue is profusely illustrated with cuts, and should be in the hands of every progressive fitter.

The Buffalo Forge Co., of Buffalo, N. Y., send us some very flattering testimonials of their system which were furnished them by experts who made an impartial test in schools in Salt Lake City and Lehi, Utah. Lack of space this issue will not allow us to print these tests but they will be found very interesting to any who care to send for them, especially architects.

The Nubian Iron Enamel Co., of Cragin, Ill., has sent us a desk calendar for the first quarter of 1894 which is most unique in some features. It is arranged so that it can be mailed in an envelope and put together on receipt by a very simple device so that it will stand upright on the desk. Every day has its appropriate verse and "Nubian" is not forgotten in any one. If you want a desk calendar that's a novelty, send for one.

At 211 Water street, New York, W. M. Mackay, manager of the New York house of Hart & Crouse, Utica, N. Y., has hung out attractive signs calling attention to his house and the Royal line of steam, hot water, hot air and combination heaters. The first floor is fitted up as an office and sample room, where the various apparatus are displayed to good advantage, and a cordial welcome is extended to all visitors. The basement and upper floors furnish storage for several carloads of goods, so that orders can be filled promptly, which is a feature that will be appreciated.

The whole capital stock of the United States Heater Co has been purchased by A. T. Henderson, vice-president, and H. W. Smith, treasurer, who will issue additional stock to the amount of $25,000, all of which has been already subscribed for. They will maintain the Detroit office as heretofore at 113 Randolph street, and the territory west of Chicago will be attended to by an office at 100 Lake street, which will be conducted by John W. Mills and D. E. McCabe. The company will manufacture boilers for steam and hot water, and also larger sizes of the Hecla and Capitol heaters, which are expected to be ready for the trade within a month or two.

The Nason Mfg. Co., 71 Beekman street, New York, issue an entertaining little pamphlet in the interests of the Equator steam heater of their manufacture. The pamphlet, bound in black cloth covers, measures 6 by 7 inches, and contains 18 pages. The text of the pamphlet is in eight stanzas, telling in metrical form the story of Deacon Crabtree's unsatisfactory experience with a hot air furnace and the excellent results that followed the introduction of an Equator heater. While the verses are of a sort to please the reader, the more casual observer will be entertained by the seven accompanying illustrations of the deacon and his good wife, who at the beginning of the story are trying, ineffectually, to keep warm; then they show their interest in the purchase and setting of an Equator heater, which makes their home comfortable and their life contented.

Jenkins Brothers' agency in St. Louis is to be discontinued.

The Ripley Detrick Supply Co. have succeeded to the business of Ripley & Bronson, St. Louis, Mo.

Bignall & Keeler Mfg. Co., of St. Louis, Mo., have removed their general office to Edwardsville, Illinois.

The Modern Heating Co., of St. Louis, Mo., have just closed up a very successful year and are in the field hunting up first class work of which they make a specialty.

New machinery has recently been put in by the Belknap Mfg. Co., Bridgeport, Conn., and the dull season has been taken advantage of to overhaul the equipment of the whole factory.

Wm. E. Bartlett, of Boston, has recently installed Exeter sectional boilers and Exeter radiators in the following buildings, for the city of Boston: Howe School, Williams School, Engine and Ladder Houses numbers 2, 10, 41, 17, and 43 and Police Station number 12.

The Niagara Radiator Co. have finished their new factory at Tonawanda, near Buffalo, and will pour their first iron about March 1st. The officers of the company are G. R. Howard, president; C. F. Waltheo, vice-president and manager; F. C. Perew, secretary and treasurer.

A catalogue of the Star steel plate furnace has been issued by its manufacturers, the Star Cornice & Furnace Co., 716 Vandeventer avenue, St. Louis, Mo. It is illustrated by views of the heaters set up for operation, and other views showing the interior arrangements of the parts in detail

The Davidson Ventilating Fan Co., of Boston, has secured the contract for placing the ventilating fans in the Majestic Hotel, New York. The fans are large, some of them being seven feet in diameter. Case engines will be used for driving the fans. The company has taken the New England agency for the Meston electric motor which is one of the standard makes in the market.

The Missouri Heating Co. of St. Louis, Mo , have just completed the hot water heating apparatus in the residence of Wm. McMillen in Portland Place. This is said to be one of the finest residences in St Louis. It is three stories high and covers an area of 45 by 105 feet. The overhead closed tank system of heating is used, the first floor being heated by indirect and the second by direct radiation, 2,500 square feet of the former and 1,750 square feet of the latter being used.

Curtis & Curtis, Bridgeport, Conn., manufacturers of pipe cutting and threading machinery have issued their new 52-page catalogue for 1894. In it they present a large number of first class engravings, which, with the descriptive matter, give a very clear idea of the machines and their points of merit. A large number of testimonial letters printed in the back of the catalogue give evidence of the popularity of the Curtis & Curtis machines. Write for a catalogue if you are interested in this line of goods. It will be sent free.

Clarence M. Kemp of Baltimore Md., who manufactures a large line of specialties, reports that his business in 1893 was twenty-five per cent greater than in 1892, and was the largest and most successful in his experience. The business has grown to such an extent that he is forced to vacate his present premises, and a new factory has been bought at the northeast corner of Guilford avenue and Oliver street, in which he will be comfortably housed by March 1. It is a well-built factory and admirably adapted for his purposes. The inquiry for his goods is large, and he anticipates a large trade for 1894.

The American Radiator Co. of Chicago, New York, and Boston, have sent out to the trade their quotation sheets for 1894. The new list shows many changes, a very large reduction in price being made on low heights of radiators. The more notable changes on standard heights are made on the Detroit plain fluted, several cents, both for steam and hot water. A change in the Pearless steam radiator is made, and the price on the standard height reduced. The price of the National four column for steam or water is reduced on the standard height, while the reduction in the prices of the low heights are too numerous to mention in detail.

The American Radiator Co., 111–113 Lake street, Chicago, are increasing their facilities for catering to their Eastern trade by constructing an enormous storage and shipping warehouse at Harrison, N. J., thirty minutes from their New York city office. The new building will contain 45,000 square feet of storage room, and will be connected by long distance telephone with the offices at New York, Buffalo, Boston and Chicago. These improvements are being made under the personal supervision of Mr. Jno. B. Pierce, vice-president of the company. Mr. W. H. Hill, of the Chicago office of this company, has been appointed assistant manager of the New York office, and Wm. B. Jenkins has been apponted to the vacancy in the New York office caused by the withdrawal of J. R. Clarke to engage in other business.

As announced in our editorial columns the sixth annual convention of the Master Steam and Hot Water Fitters' Association of the United States will be held at the Broadway Central hotel, New York, on the 19th, 20th, and 21st of June. Mr. Tilly Haines, whose name is so familiar to the public as a successful hotel man, is proprietor of the Broadway Central, and will see that all are properly looked after and fairly treated on the occasion of the next convention. Rates, American plan, will be from $2.50 to $4.00 per day, the reduction being that their usual $3.00 per day accommodations will be at the $2.50 rate; $3.50 at $3.00; $4.00 at $3.50; and $5.00 at $4.00 per day. On the arrival of guests special and satisfactory arrangements can be made on the European plan, if any so desire. The appointments at the Broadway Central are specially favorable to those who may desire to exhibit goods during the convention. Full particulars regarding this feature can be had, and arrangements made, by addressing the hotel people direct.

The Jarecki Mfg. Co., Erie, Pa., are getting a new 300-page catalogue. Every dealer who sees this notice should write to them for a copy.

The Herendeen Mfg. Co., of Geneva, N. Y., have opened a New York office at 46 Taylor building, 39–41 Cortlandt street, with Messrs. J. G. and A. H. Dudley as managers.

The Wells and Newton Company, operating United States Heating and Plumbing Company, 1108 and 1109 Monadnock building, have removed to 274 Dearborn street, same building.

The Backus Water Motor Co., manufacturers of ventilating fans, are moving from the old quarters they have occupied for several years, at New Jersey R. R. avenue, Newark, N. J., to a fine new brick factory on the site 174 to 182 Pennsylvania avenue, same city.

The constitution and by-laws of the Master Steam and Hot Water Fitters' Association have been published in a neat little pamphlet, together with the list of officers since the inauguration of the association in 1889 up to date. It may be had of Secretary Reynolds, 625 Metropolitan Life Building, Madison Square, N. Y.

Broomell, Schmidt & Co., York, Pa., have opened an office at 146 North Third street, Philadelphia. The services of Mr. Fred. Ruoff, an experienced man, have been secured as manager. A full line of "Our Own" radiators, the Heatencook range, the Keystone boiler, horizontal boilers, steam traps, steam pumps, etc., will be carried in stock. A general line of contracting for steam and hot water heating will be undertaken.

The Toronto Radiator Mfg. Co., Toronto, Canada, has favored us with an attractive calendar issued in the interest of their well known Safford radiators. The lower half of each sheet of the calendar contains the card for the days of the month, the upper part being occupied by a fanciful engraving, reproduced in different colors, showing the Safford radiator for a background and surrounded by representatives of the various nations of the world.

W. C. Joy, of the New York office of T. C. Joy & Co., reports that Joy Crescent radiators will be used in the following well-known new buildings for which the "Bundy" radiators were originally specified: Manhattan Life Insurance Building, the largest office building in the world, where 25,000 feet will be used; Home Life Insurance Building, 11,000 feet; Hotel Marie Antoinette, 10,000 feet; and the Sheldon Building, all of New York city.

The Herendeen Mfg. Co. of Geneva, N. Y., have opened their own offices in Boston at 54 Oliver street, corner of High. The new store will be in charge of Fred W. Herendeen, so well known among the fitters of the West. He will be assisted by Mr. A. E. Jessop, who will, we predict, make a record in this field as one who will be well liked by the trade. A full line of the latest steam and hot water heaters will be shown, and the company will be glad to have all their friends drop in and see them. E. W. Herendeen, president of the Herendeen Mfg. Co., sailed for Europe on February 10th accompanied by Mrs. Herendeen and Fred W. Herendeen of the Boston office.

Jenkins Brothers, 71 John street, New York are distributing to the trade their 1894 catalogue and price-list. This is an oblong pamphlet of convenient size, and contains illustrations and descriptions of the various Jenkins specialties, beginning with the Jenkins disk removing lock nut, the Jenkins key stuffing boxes, and then a number of pages are given to the Jenkins valves. A very large variety of these well-known goods are illustrated, and the various sizes and styles are described and the prices given. Later in the pamphlet other specialties are referred to, including their standard packing.

At the annual meeting of the American Boiler Company of Chicago, which was held January 17, the following directors were elected: W. K. Pierce, Syracuse, N. Y.; Henry T. Richardson, New York; A. P. Richardson, Chicago; Marsh C. Pierce, Syracuse, N. Y.; Clarence V. Kellogg, Chicago; Geo. E. Downe, Chicago. At a subsequent meeting of the board of directors the following officers were elected: president, W. K. Pierce; vicep-resident, Henry T. Richardson; treasurer, Clarence V. Kellogg; secretary, A. P. Richardson, Chicago. The officers announce that there will be no change in their policy. Henry S. Downe will remain with the company and with headquarters in Chicago will travel in Illinois.

The American Heating Co., of St. Louis, Mo., reports that the past year's business amounted to $150,000. Among the prominent contracts they have filled may be mentioned the Union depot, St. Nicholas hotel, Martin building, Union Club, Columbian Club, and Culver buildings. They have lately closed contracts for overhauling and remodelling the heating of the five-story building occupied by the Parisian Cloak Co., Broadway and Washington avenue. They have also closed contract for heating a 30 stall round house for the C. B. & Q in North St. Louis where they will use about 16,000 feet of 1¼-inch pipe in coils, placed in pits. Reduced steam pressure will be used, the condensation being returned to the boiler by means of a Kieley governor.

The Crane Company of Chicago, Ill., have taken the seven-story building at 122-130 Centre street corner White, New York. They will carry an extensive and complete line of fittings for steam, water and gas, in cast, malleable and wrought iron and brass goods. Their wedge gate valves will be one of the leading specialties, and they will also handle a complete line of pipe cutting and threading machinery made by D. Saunders' Sons, Yonkers, N. Y. The basement will be used for a pipe cutting and threading department, where the trade will be supplied with pipe, according to specification, from 2 up to 16 inches, special machinery being provided for threading fittings of the largest size. Two 75 horse-power boilers and a 75 horse-power Harris-Corliss engine will be used for running the tools and the elevators in the building. The establishment will be under the management of G. Frank Uhler, assisted by Waldron Moore and J. M. Uhler, formerly with Eaton, Cole & Burnham.

The following correspondence explains itself:

NEW YORK, Jan. 9, 1894.

MESSRS. KROESCHELL BROS, CHICAGO, ILL.

Dear Friends:—Inclosed herewith find copy of action taken by the Executive Committee upon the death of your beloved brother.

I feel, under the circumstances, that I have the privilege of adding a word, for probably no man in our association was better acquainted with Herman Kroeschell than I, except it be yourselves. Undoubtedly I realize as fully as any outsider can his relations with you and importance to you. In my mind's eye I can see you looking at that vacant desk and agreeing among yourselves that there is no one living who can fill it to the satisfaction to you that he did. I feel now that I can see you turning to it for information, counsel, and advice. While each of you had your departments to look after, his, from necessity, required a general knowledge regarding them all.

When one in whom was stored the trust and in a sense the responsibility of the whole is so suddenly taken from a family and business relations such as yours, where no question had ever arisen as to the intentional correctness of transactions within or without, it is a paramount loss, and while my sorrow cannot be classed with yours, I desire to state that in your loss you have my deepest sympathy. Whenever this circumstance reverts to my mind, there is a calm sadness comes into my heart. Herman Kroeschell was a man in whom all implicitly believed and trusted, and I wish it were within my power to find words to do his character full justice

In sorrowful sympathy with you, I remain, ever yours, GEORGE H. REYNOLDS, *Secretary.*

NEW YORK, Jan. 9, 1894.

MRS. HERMAN A KROESCHELL, CHICAGO, ILL

Dear Madam:—I inclose with this, copy of a resolution passed by the Executive Committee of our Association relative to your late bereavement.

You well know, better than I can convey to you in words, the deep and sorrowful surprise it was to me to learn of Herman's death. Not even having heard of his illness, I do not know of any news that I was so little prepared to hear.

His having been the first treasurer of the National Association brought us in close contact from the very first steps in its organization; and his remaining in that position for practically three years, kept me in constant communication with him for all that time. Through his unassuming nature he only became well known to those with whom he had intimate business or social relations, and perhaps as much as I could say is that I have never heard anything but favorable criticism from those who knew him. He was in faithfulness, integrity, and character as a private citizen, what Abraham Lincoln was as a public man. In looking back over his life, as I met him and knew him, I am led to the remarkable expression that I have never heard him named except in praise, which, holding the position I do, would not have been the case except he had been universally loved, trusted, and admired.

I wish it were within my power to say something that would make the vacant chair look more cheerful; something that would lessen the soreness of your heart. His sudden and premature death is a loss to the world, to those with whom he came in daily contact, and to our organization, and when I feel what a keen sorrow it brings upon me I think I can, in a slight measure, appreciate your own intense grief.

With the deepest sympathy of Mrs. Reynolds and myself, we remain most sincerely your friends,

GEORGE H. REYNOLDS, *Secretary.*

NEW YORK, January 9, 1894.

MR. E. J. YUNKER, Sec'y Chicago Local, Master Steam & Hot Water Fitters' Association.

Dear Sir:—Upon learning of the death of Herman A. Kroeschell, who was the first treasurer of our National Association and continued in that position for three years, the present executive committee passed the inclosed resolution.

I feel at liberty to say a word myself to the Chicago members relative to this loss, for indeed it is a loss. It seems to me when I reflect upon it that it is but a fair admission to say that virtually your chief anchor is gone. There are others among you whom in ordinary times you will feel it safe to make fast to, but in the case of a sudden alarm or the brewing of a storm, where faithfulness that is absolute was required, all eyes would turn naturally to Herman Kroeschell.

If any of us were to ask ourselves to-day what we could say derogatory of him, the reply would come silently from our hearts, "Not one word." On the other hand, if we were to ask ourselves what we could say in his praise, the answer would invariably be, "Everything." This, in the face of the natural disposition of competitors to distrust each other, is a remarkable admission indeed.

His untimely death is a great loss to the Chicago Local; it is a loss to our National Association, and now knowing full well how deeply you all feel this, I wish to join with you in that sorrow which rarely comes for the departure of a fellow man. We shall not soon forget him. And it will be pleasant in our recollections to feel that all who knew him would go a long distance out of their way to lay a flower upon his grave.

It is not ungenerous to others to say that he had no equals, for his was a rare personality.

Sorrowing with you, I remain sincerely yours,

GEORGE H. REYNOLDS, *Secretary.*

NEW YORK, December 14, 1893.

CHICAGO LOCAL, MASTER STEAM & HOT WATER FITTERS' ASS'N.

Gentlemen:—It having come to the knowledge of the Executive Committee of the Master Steam and Hot Water Fitters' Association of the United States, that one of the first members of the association, a former treasurer, and their esteemed friend, Mr. Herman Kroeschell, had passed from this earth, it seemed to them but fitting that they should express, on behalf of the association, the esteem with which he was held by them and by the members thereof.

It was therefore *Resolved*, at a meeting held at the National office in New York on November 21, 1893, that an expression of esteem and condolence be sent to the family of our deceased confrere, and that a blank page be inscribed to his memory in the records of the said association.

J. LELAND WELLS, JAMES CURRAN, JOHN D. CLARKE, ELIAS D. SMITH, A. MERCER, *Executive Committee.*

Approved:

E. RUTZLER, *President.*

(Resolution passed by Chicago Local.)

CHICAGO, Dec. 28, 1893.

Whereas, the grim messenger Death has entered our circle and laid his icy hand on one of our most prominent, earnest, and faithful workers, Herman A. Kroeschell, therefore

Be it *Resolved* that the Master Steam Fitters' Association feel that in this visitation they have been bereft of a wise counsellor, a valued member, an honest and faithful business man, and one who has endeared himself to all with whom he came in contact.

Be it further *Resolved* that these resolutions be spread upon the record, and a copy be sent to his wife and children, and also to his surviving brothers, extending to them our heartfelt sympathy and condolence, in this their hour of affliction; assuring them that we share in their grief, and will ever hold in kind remembrance our departed associate.

JOHN WOODMAN, *Pres.*
E. J. YUNKER, *Sec'y.*

At a meeting of the Lewis Boiler Co., held December 30th, two new directors were chosen, Major J. D. Anderson of Maine and Ralph Lewis of Wakefield, Mass. Major Anderson was elected president to succeed W. A. Lewis, and Ralph Lewis was elected treasurer to succeed Geo. F. Lewis. Mr. J. E. Lewis continues as vice-president and general manager. Major Anderson is a graduate of Bowdoin College, ex-U. S. pension agent for Maine; past Deputy Commander G. A. R., and now treasurer of the Eastern Branch National Home for D. V. S.

D. P. Gosline has secured the contract for the electric lighting of the New England store of Huyler, the confectioner. Eddy dynamos and White & Middleton gas engines will be used.

The Model Heating Co. of Philadelphia, New York, and Chicago, are placing one of their No. 52 combination heaters in the residence of Mr. William Cramp on Broad street, Philadelphia, heating 40,000 cubic feet of space by hot air and 20,000 cubic feet by indirect hot water.

Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until March 7 for the low pressure return circulation steam heating and ventilating apparatus for the United States Post Office building at San José, Cal. Drawings and specifications may be obtained from the Supervising Architect, Washington, or from the office of the superintendent at San José.

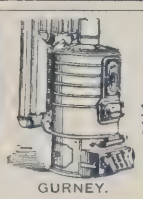
P. C. Doherty, 112 Main street, Poughkeepsie, N. Y., has placed two 25 horse-power boilers, from the Fishkill Landing Boiler Works, in St. Mary's Church, corner South Hamilton and Church streets. The boilers supply steam for about 3,000 square feet of radiation. Mr. Doherty has also placed a hot water heating plant in the new building occupied by the Highland Post, at Highland, N. Y.

The Joseph Dixon Crucible Co., of Jersey City, N. J., about a year ago issued a pamphlet on lubricating graphite. It embodied an elaborate scientific opinion by Prof. R. H. Thurston on the value of graphite as a lubricant, and much interesting information on the subject from practical men. The pamphlet has had a large circulation, and the company has been enabled to obtain from well-known men a vast amount of additional knowledge on the uses of graphite. Another pamphlet, twice the size of the former, has been issued, and a copy will be sent free of charge to all interested in the subject of friction and lubrication.

(*Continued on page 24.*)

Gurney

HOT WATER
HEATERS AND RADIATORS
FOR HEATING
Dwellings, Public Buildings, Etc.
BY
HOT WATER CIRCULATION.


GURNEY.

THEY LEAD EVERYTHING.

Send for our literature and you will see why the Gurney Heaters are yet

COMPLETELY UNRIVALED.

Gurney Hot Water Heater Co.
HEAD OFFICE:
163 Franklin St., Boston, Mass.
BRANCH OFFICE:
59 Wabash Ave., Chicago, Ill.
SELLING AGENCIES:
Johnson & Co., 71 John St., New York.
C. F. Trachsel, 246 Arch St, Philadelphia.


DOUBLE CROWN.

THE
Sanitas Regal Closet.

OUR LATEST PATTERN.

The same in principle as previous patterns, but with larger bowl and vent, and several other improvements.



The seat is attached directly to the Pottery, dispensing altogether with Seat Brackets. The name "SANITAS" is synonymous with *Safety, Simplicity* and *Science*, and in no plumbing appliances are these qualities so perfectly combined as in the "SANITAS REGAL CLOSET."

Our New Catalogue for 1894 is now ready for Distribution.

Smith & Anthony Company,

54 Union St., BOSTON. 56 Beekman St., NEW YORK. 217 Lake St., CHICAGO.

The J. L. Mott Iron Works, at 133d street New York, which have been shut down for the past few months, are now reopened and running full time.

Weir & Nixon, 1410 No. 6th street, Philadelphia, are very busy this season with their combination steam and warm air heating apparatus. They have been very successful in large church work.

The Huette-Barler Mfg. Co., of Chicago, have changed the name of the corporation to the A C. Barler Mfg. Company. The company manufacture the well known Barler Ideal oil heater at 111 and 113 Lake street.

J. A. Buckwalter has been elected president of the Buckwalter Stove Co., Royersford, Pa.; I. N. Buckwalter, vice-president; T. D. Buckwalter, treasurer; R. E. Springer, secretary; W. M. Stauffer, superintendent.

The Atlantic Automatic Gas Heating & Regulating Co. has been incorporated to operate the Ware patents in Philadelphia, Baltimore, Washington and vicinity. The principal office will be at 403 Market street, Philadelphia, Pa.

The City Hospital of Cincinnati is to be provided with the exhaust fan system of ventilation, and the heating plant will be remodelled to meet the requirements of the system. The expense of the change, it is estimated, will be about $5,000.

P. H. & F. M. Roots, Connersville, Ind., send us a very appropriate glass disk paper weight which contains the advertisement of the Root gas exhauster, valves, and fittings in magnified letters, making a very pretty desk ornament. They send them to reliable agents.

We have received the catalogue of the Monitor Steam Generator Co. of Landisville, Pa., which explains carefully the good features of their boilers, illustrated by cuts. Many testimonials accompany it. Their Philadelphia office is at 49 No. 7th street, in charge of C. F. Bachler, general agent.

Smith & Winchester of Boston will place a new boiler of their own manufacture on the market this season. The trade will be asked to name it, and three judges will decide as to which name is best The winner will receive one of their best boilers free. A circular will shortly be sent out giving full details.

The following directors have been elected by the Kewanee Boiler Co., at Kewanee, Ill.: E. E. Baker, Horton Vail, J. P. Dugger, B. F. Baker, August Wagner, and T. P. Pierce The officers are: president, E. E. Baker; vice-president Horton Vail; secretary, J. P. Dugger; treasurer, B. F. Baker.

The new "Power" boiler and engine catalogue of the Herendeen Mfg. Co. of Geneva, N. Y., is out. It is profusely illustrated with cuts of the latest ideas in boiler manufacture. The steel used in the construction of the Herendeen boilers is of the first quality, homogeneous flange plate, 60.000 pounds tensile strength, with an elongation of from 20 to 25 per cent and a reduction in area of from 45 to 50 per cent.

J. J. Wilson, heating engineer for the Fuller & Warren Co., Troy, N. Y., recently visited a number of heating plants installed in New England last fall in which their goods were used, and reports general satisfaction. He is about to make a similar visit among the trade in the West.

Sealed proposals will be received at the office of the Supervising Architect, at Washington, D. C., until February 21 for the plumbing and gas piping for the United States Post Office building, Lowell, Mass. Drawings and specificatians may be obtained from the Supervising Architect, Washington, or at the office of the superintendent at Lowell, Mass.

The Abram Cox Stove Co. of Philadelphia, did a larger business during 1893 than in the previous year. This company make 69 different styles of furnaces, ranging in price from $16 to $200. They are the proprietors of the Model Heating Co., which makes the well known Novelty circulator for hot water, and who will be ready soon with a new boiler. They have just completed a very extensive show room in the factory at American and Dolphin streets, 120 by 24 feet, and will there show a full line of goods. If you want to know all about their apparatus, send for "What's Inside?"

The Niagara Radiator Co. are building a radiator foundry with a capacity of 1,000,000 feet of radiation per year at North Tonawanda, N Y., adjourning the blast furnace of the Niagara Iron Co. The company expect to melt iron March 1 and have put into their foundry and their machine shop the latest and most improved labor saving devices and machinery. They will make a full line of direct and indirect radiators for both steam and hot water. The officers of the Niagara Radiator Company are: president, G. R. Howard; vice-president and manager, C. F. Walther; treasurer, F. C. Perew.

The Buffalo Forge Co., Buffalo, N. Y., have put in operation their heating system in the general office buildings of the East Tennessee Railroad at Knoxville, of which the Knoxville *Daily Journal* has the following: "The new system is a model of comfort and convenience, its excellent sanitary feature especially commending itself to the numerous inhabitants of the big four story building. Through the courtesy of General Manager Hudson, a *Journal* representative was shown the plant of the system which is located in the basement of the building. An eighty-inch Buffalo Forge Co.'s fan draws air through a heater of 1,800 feet of steam pipe. The fan at normal speed will change the entire air in the building every fifteen minutes, and can be regulated at will. It will furnish 12,000 cubic feet of air per minute, and its distribution after leaving the fan in pipes varies according to the amount necessary to furnish the various rooms of the building. The steam is furnished by locomotive boiler, the fan being operated by a gas engine. This fan's work will be greatly appreciated in the summer, for its distribution of refreshing whiffs of air during the sultry months. The system was arranged not so much to economize on coal, as to provide for the comfort and convenience of the several officials and numerous clerks in the building."

The contract for the heating plant in the National Union Building, of Toledo, Ohio, has been awarded to Shaw, Kendall & Co., of that city. The plenum system will be used, the auditorium being heated by small openings underneath the chairs. In the summer the fans will be operated to cool the building

The Buffalo Forge Co., Buffalo, N Y., have secured the contract for the heating apparatus in the paint shop of Mr. Hudson, of Knoxville, Tenn. They also secured the contract for the apparatus in his wood working shop. Both shops are 33 by 90 by 337 feet, and the heating plant entails the use of very large fans.

The Stradling Plumbing and Heating Company of Utica, N. Y., held its annual meeting on January 19 and elected the following directors: E. W. Stradling, E. H. Bice, E. J. Stradling, J. J. Droz, A. H. Dobson. E. W. Stradling was elected president; E. H. Bice, vice-president; E. J. Stradling, secretary; A. H. Dobson, treasurer.

At the last annual meeting of the American Boiler Co., held in Chicago, the following directors were elected: William K. Pierce, Henry T. Richardson, George E. Bowne, A. P. Richardson, M. T. Pierce, and C. V. Kellogg. The officers elected are: president, William K. Pierce; vice-president, Henry T. Richardson; secretary, A. P. Richardson; treasurer, C. V. Kellogg. Henry S. Downe remains with the company, with headquarters in Chicago. The management of the branch offices of the company will remain as heretofore, so far as known, and the policy of the company will not be changed.

WANTED.

Announcements in this department will be inserted at the uniform rate of twenty-five cents per line. For five or more insertions of the same advertisement we make a discount of 10 per cent. Calculate on nine words to a line.

WANTED—A pattern-maker. We want a first class pattern-maker to make patterns for cast iron stoves and hot-water boilers. Apply at once, stating age, experience, who you have worked for with references, and wages desired. Address Herendeen Mfg. Co., Geneva, N. Y.

WANTED—A salesman in every town and city to sell our Faultless Furman Steam and Hot Water Boilers; an energetic, clear-headed man can make big wages and have steady employment by addressing the Herendeen Mfg. Co., Geneva, N. Y.
Cut this out, as it will not appear again.

WANTED.—An active man, acquainted with architects and the plumbing and steam heating trade, to take position as solicitor in New York and vicinity with established manufacturing house. Address, giving name and present or recent business connection, Alexander, care HEATING AND VENTILATION.

The "Sun" do Move.

But we are not satisfied.

This year we want every fitter to know all about the **"SUN,"** and when he does, **we** know he won't be able to order quite enough.

The **"SUN"** is built from carefully selected steel plates and **"on honor,"** and has an unbroken record for economy of fuel, steadiness of heat, and ease of management.

The **"SUN"** is made for **Steam.**

The **"SUN"** is made for **Hot Water.**

We want live agents for which good territory will be assigned

Send for descriptive catalogue with testimonials of its hundreds of delighted users.

The RAYMOND & CAMPBELL MFG. CO.

MIDDLETOWN, PA.

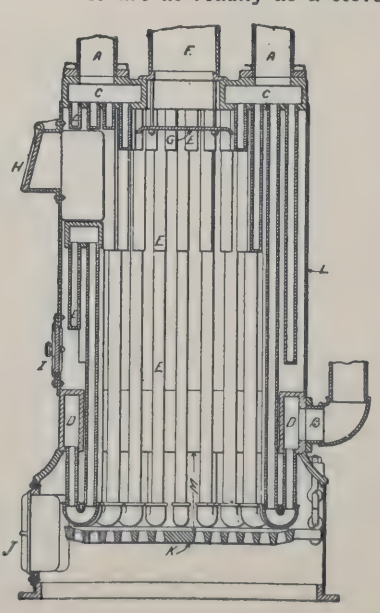
THE RAYMOND & CAMPBELL MFG. CO,
244 Water Street, New York.

THE
"Windsor" Hot Water Heaters
AND RADIATORS.

The best and most economical system of HOT WATER HEATING in the market.

SUPERIOR ADVANTAGES.

Largest heating surface in close contact with fire.
Largest grate surface for size of heater.
Perfect combustion of and greatest economy in fuel.
Requires least attention.
Unsurpassed for durability.
With our half-inch wrought iron pipe radiation, will respond to fire as readily as a stove.



KEY TO CUT:

A—Flow.
B—Return.
C—Upper Water Ring.
D—Lower Water Ring.
E—Drop Tubes.
F—Smoke Flues.
G—Baffle Plate.
H—Feed Door.
I—Clean-out Door.
J—Draft Door.
K—Grate.
L—Jacket.
M—Vertical Grate Surface.

AGENTS WANTED.

For Catalogue, Estimates and Information, Address the Manufacturers,

WINDSOR HEATER CO,
GALENA, ILL.

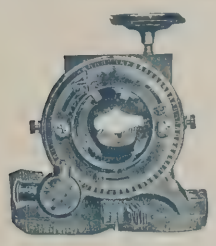
James B. Clow & Son, of Chicago, have taken the western agency of the Buffalo Steam Pump Co.

The Fuller & Warren heating and ventilating system has been adopted for the new school building at East Chesnut and Franklin streets, Lancaster, Pa.

Lynch & Woodward of Boston, are doing the heating work in the Industrial Trust Co.'s building, Providence, R. I., and in Mrs. Leopold Morse's elegant residence at Danvers, Mass., using Exeter radiators.

The business of the Kernan Furnace Co., of Utica, N. Y., has grown so largely that a new plant has been completed at East Utica, N. Y., and the works are now in full operation.

(*Continued on page 26*).



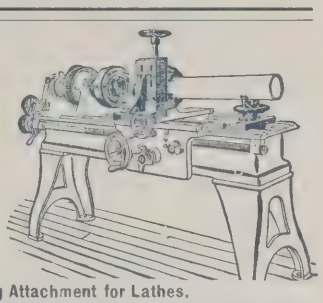
THE WILSON BILL

Need not alarm you. Don't hold back your orders for our pipe cutting and threading machinery, waiting for the bill to become a law, because the prices of our machines will remain the same. They are fully covered by patents in the United States and foreign countries, and are manufactured by us only. We should be pleased to correspond with you if you are in the market for anything in this line.

Forbes' Patent Die Stock, Pipe Cutting and Threading Machine for Hand or Power. Also Pipe and Bolt Threading Lathe Attachment.

SEND FOR ILLUSTRATED CATALOGUE.

CURTIS & CURTIS, 46 Garden Street, Bridgeport, Conn.



Portable Hand Machines we make enable one man to cut and thread 8 inch pipe. The Curtis Pipe and Bolt Threading Attachment for Lathes.

BURRELLE, on DEY ST.,

ISSUES

"POINTERS"

OR

"ADVANCE NEWS"

For Contractors and Supply Houses, covering all lines of construction.

FOR PARTICULARS ADDRESS

FRANK A. BURRELLE, Prest.,

151 Western Union Building

(8 DEY STREET),

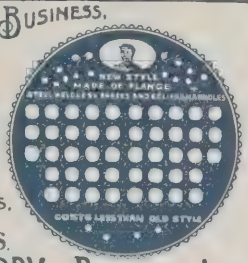
NEW YORK.

BEING IN THE BOILER BUSINESS,

MAKING STATIONARY TUBULAR BOILERS EXCLUSIVELY.

WE CAN MAKE A BETTER BOILER AND ALTHOUGH WE MAKE THEM OF FLANGE STEEL WITH WELDLESS BRACES AND ECLIPSE MANHOLES SELL THEM FOR LESS MONEY THAN OLD STYLE ONES.

WE FURNISH NEATER LITHOGRAPHS AND DETAIL ILLUSTRATIONS OF THIS CLASS OF BOILER THAN ANY FIRM IN THE UNITED STATES.



FULTON STEAM BOILER WORKS AND FOUNDRY. RICHMOND, IND.

ORDER PLUMBING ORDER

GAS WATER STEAM

ORDER Supplies of ORDER

SMITH & WINCHESTER

19-37 WENDELL ST., BOSTON, MASS.

STEAM PIPE AND BOILER COVERING.



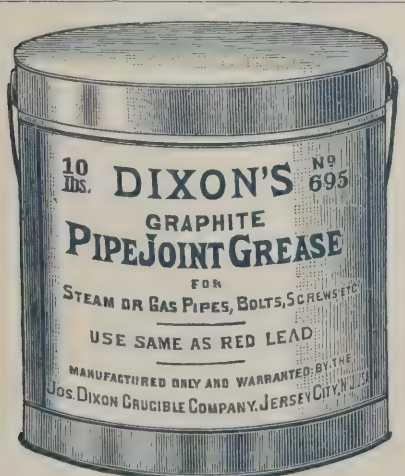
Mineral Wool. Absolutely Fire-Proof and Perfect Non-Conductor.

Best on the market, light, durable and easily applied. Send for samples, prices, etc.

CHICAGO FIRE-PROOF COVERING CO.,

47 FRANKLIN STREET, CHICAGO.

BOSTON, 159 PEARL STREET. PITTSBURGH, 415 HUSSEY BLDG



FAR BETTER AND CHEAPER THAN RED LEAD

Makes a tighter joint than red lead, that can be opened with perfect ease many years after.

Invaluable for all steam, gas and water piping, and equally useful for smearing gaskets on flange joints of meters, traps, and for bolts, screws, etc.

JOS. DIXON CRUCIBLE CO.,

JERSEY CITY, N. J.

BROOMELL, SCHMIDT & CO.,

(LIMITED.)

YORK, PA. PHILADELPHIA, PA.

STEAM HEATING CONTRACTORS.

WE MANUFACTURE

STEAM AND WATER BOILERS FOR RESIDENCE WORK. RETURN TUBULAR STEEL BOILERS 25 TO 150 H. P. RADIATORS FOR STEAM AND WATER. ROUND, HALF ROUND AND POST RADIATORS, SPECIAL CASTINGS, ETC.

Correspondence solicited from Architects, Owners and Builders. Address the

MAIN OFFICE AT YORK, PA., OR PHILADELPHIA OFFICE, 146 NORTH 3D ST.

The United States Heater Company has elected the following officers for this year: president, Geo. A. Deucharme; vice-president (first), A. M. Henderson; second, Jno. W. Mills; secretary, H. A. Smith; Treasurer Henry T. Cole.

Graphite as a Lubricant, second edition, revised, 1894, is before us. This excellent little work should be in the hands of every plumber and steam fitter in the civilized world as it contains tests of great value. We have frequently mentioned the importance of using graphite in joint work, and we trust that all our readers will send for the book, which is mailed free by the Joseph Dixon Crucible Co., Jersey City, N. J. Please mention HEATING AND VENTILATION.

Giblin & Co., as announced in our last issue, have succeeded to the business of Head's Iron Foundry, Utica, New York, manufacturers of the Standard and Rival furnace. The new name involves no change in the management of the business, which will be continued as heretofore. Last year's business, the firm reports, was very good, having been nearly as large as in former years. They have made several improvements in their furnace and boilers, and anticipate that the business of the coming year will be excellent. The salesmen in their differrnt territories remain as before. Geo. J. Giblin covering Pennsylvania, New Jersey, Maryland, and much of the West; Henry Cowles having New York and the New England States; Michigan, Ohio, and Indiana being covered by Robert Jagers.

Our well-known, absolutely dry

RADIATOR BRONZES

and quick-drying

BRONZE LIQUID

are the most brilliant in the market.

Pale & Rich Gold, $1.00 lb. Orange & Copper, $1.00 lb.

Silver, $1.25 lb. Bronze Liquid, $1.25 gall.

HEADQUARTERS for ALUMINUM BRONZE.

BERNHARD MEINERS,

49 Murray Street, NEW YORK.

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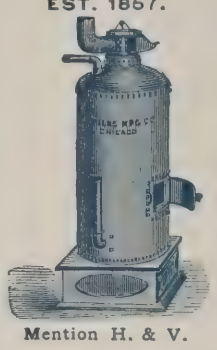
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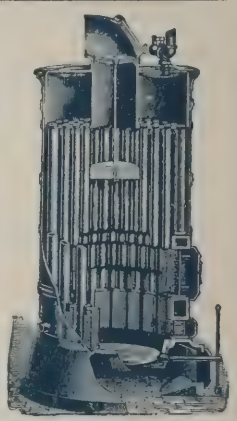
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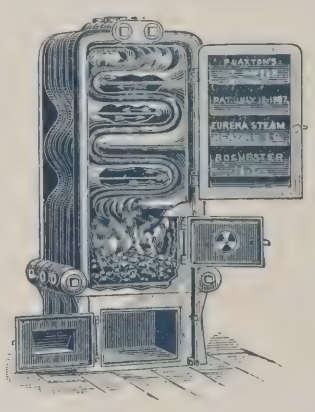
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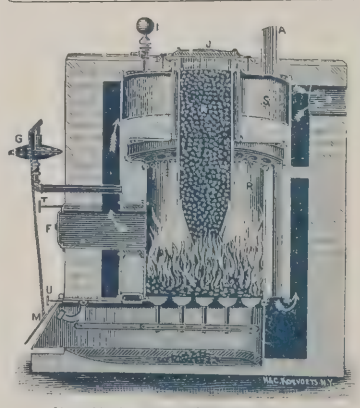
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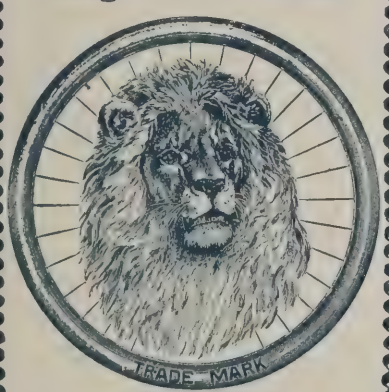
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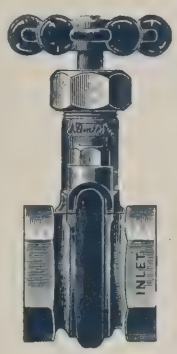
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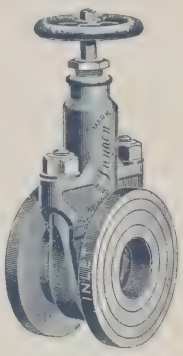
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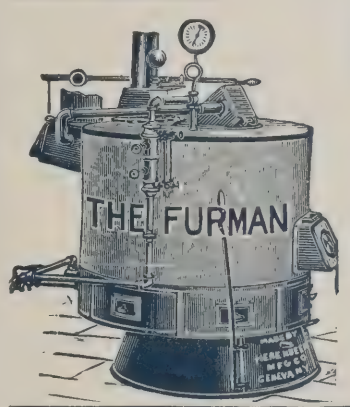
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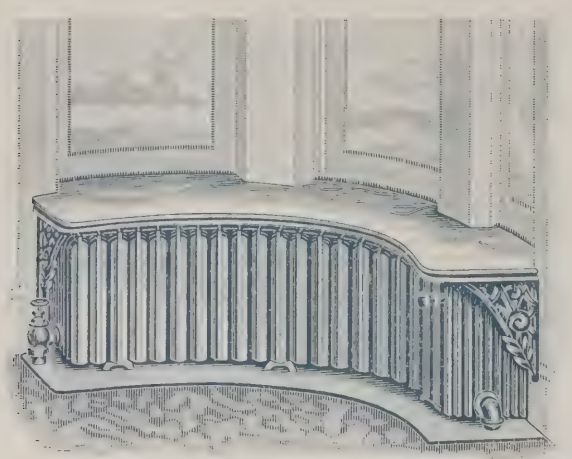
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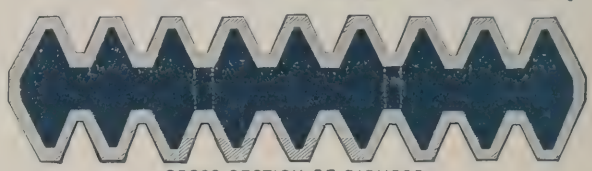
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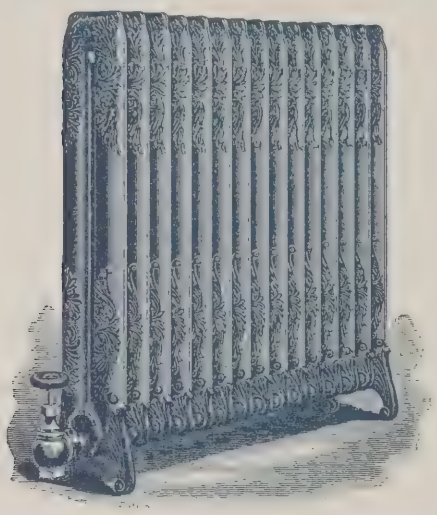


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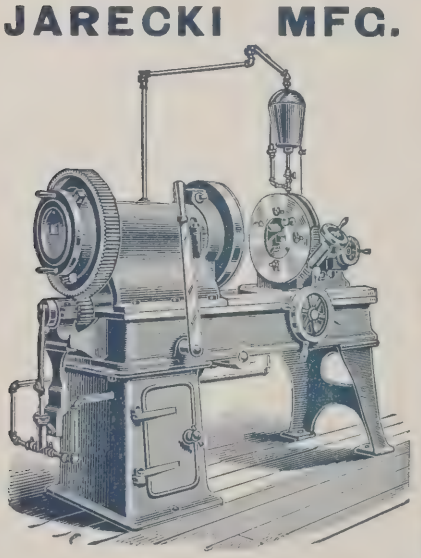
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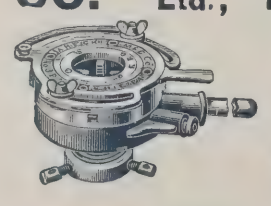
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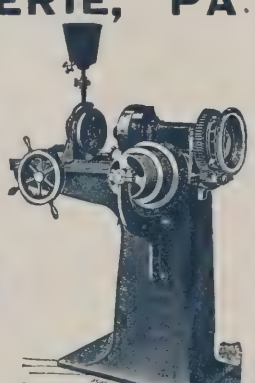
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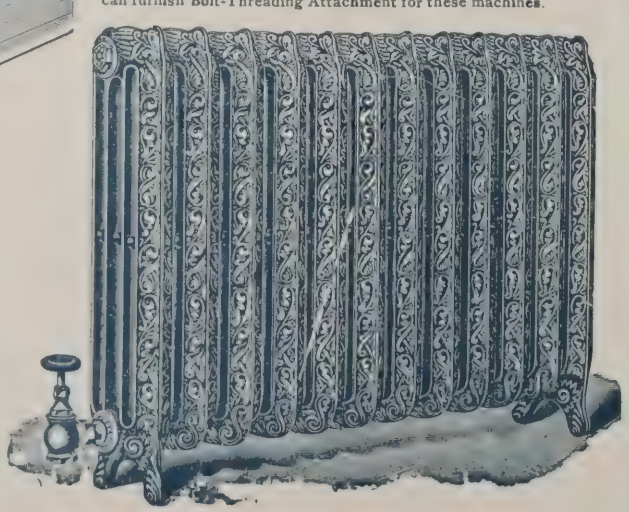
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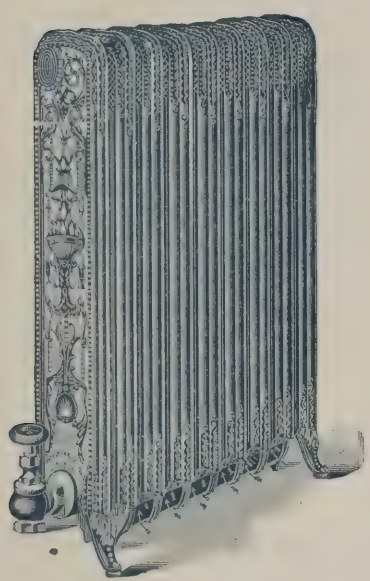
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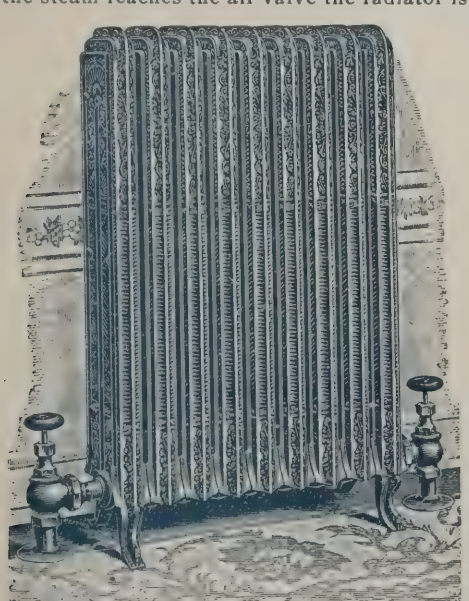
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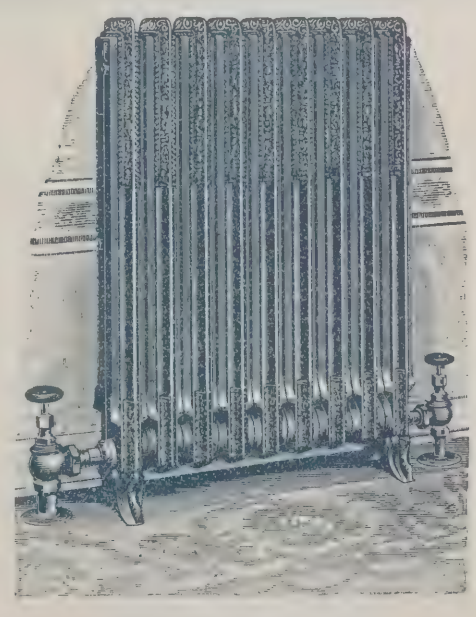


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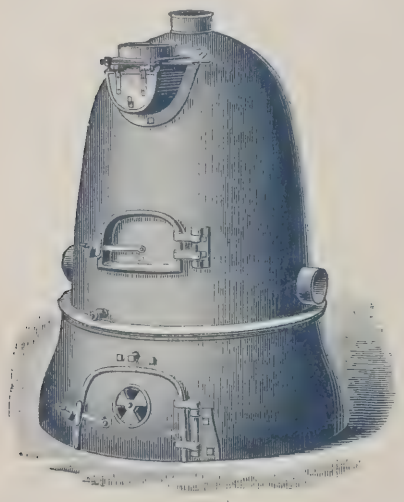
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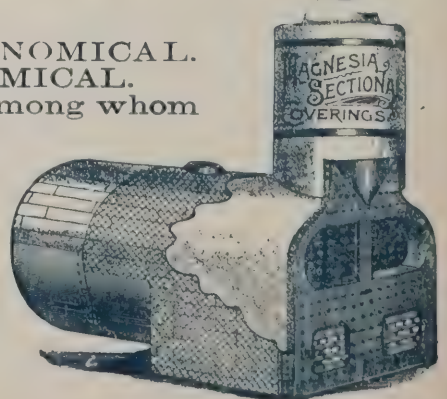


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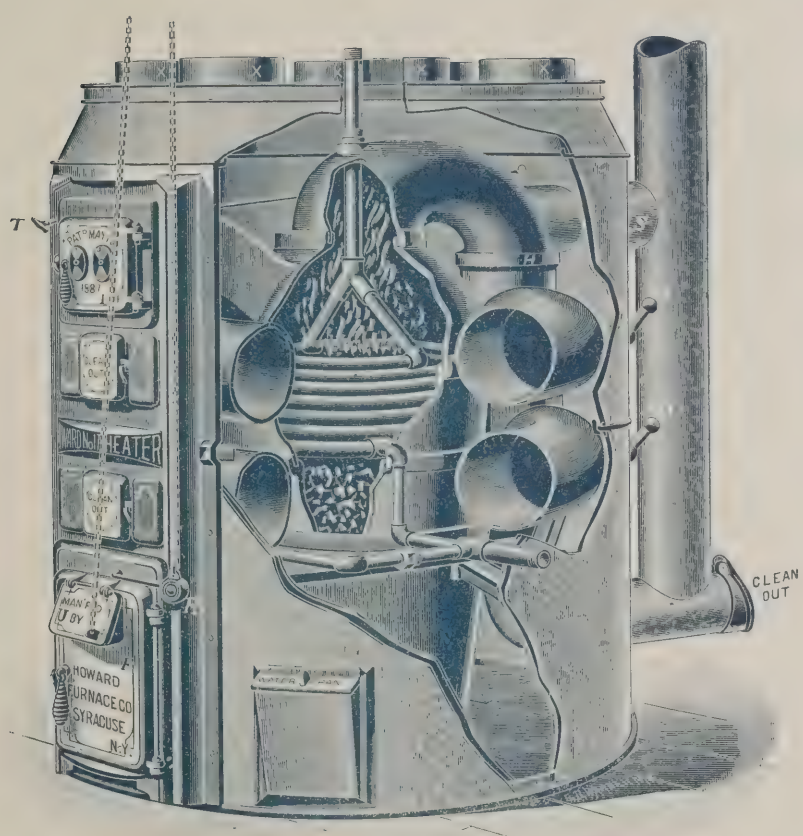
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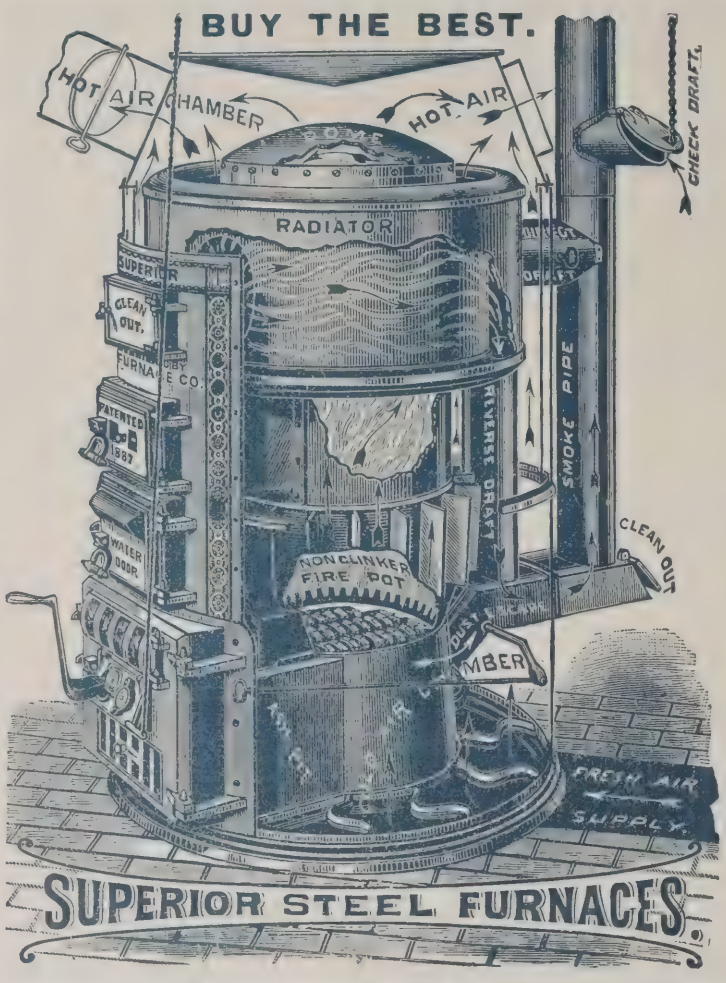
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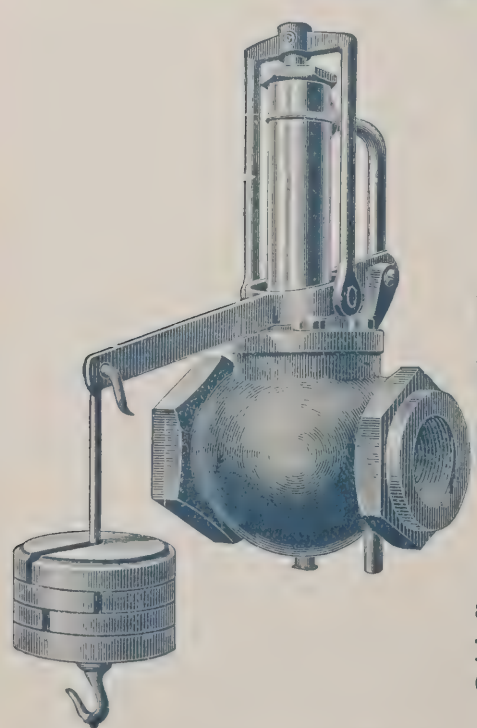
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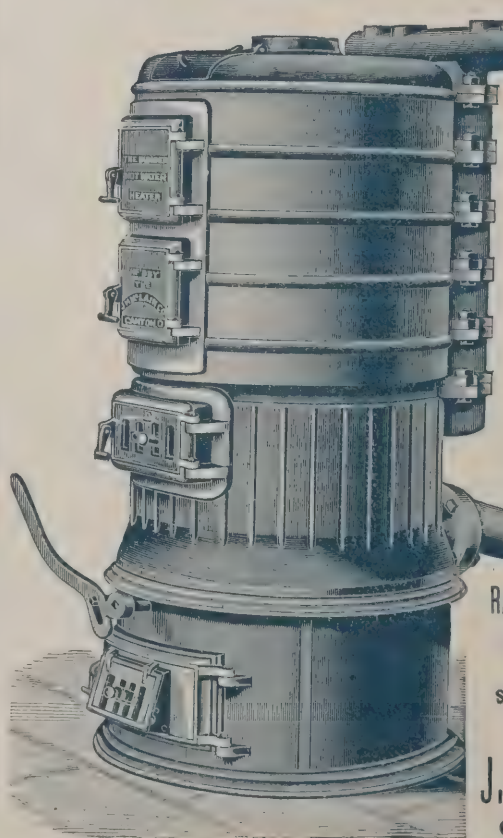
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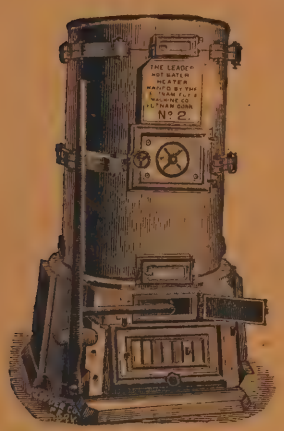
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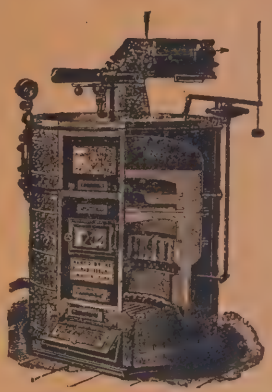
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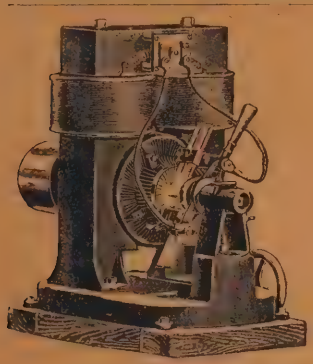
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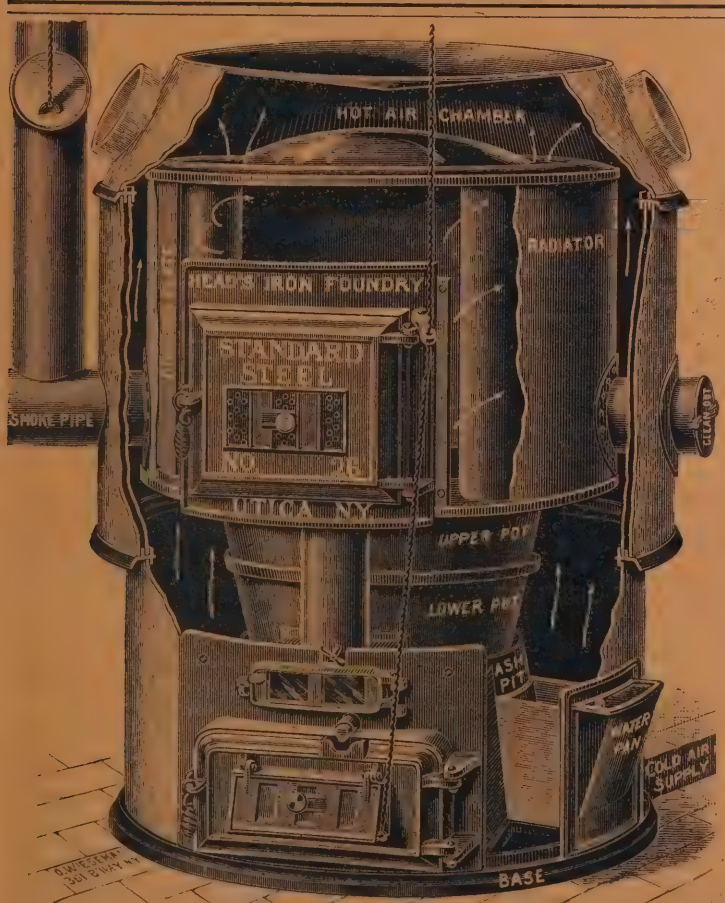
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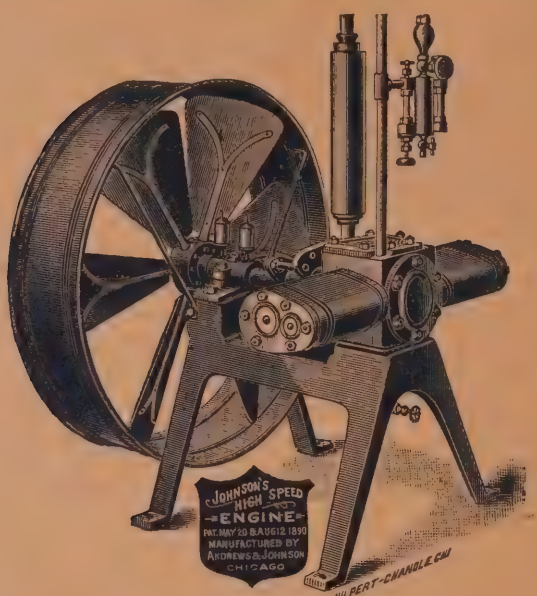
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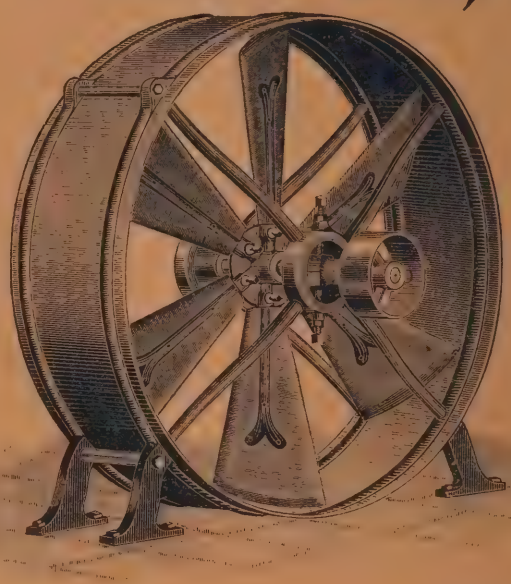
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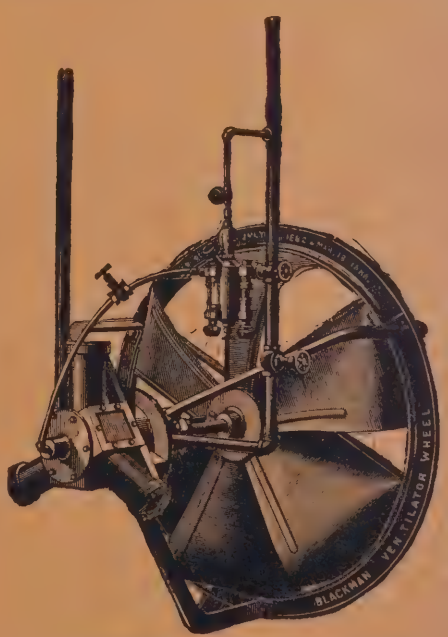
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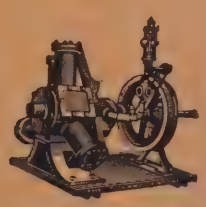
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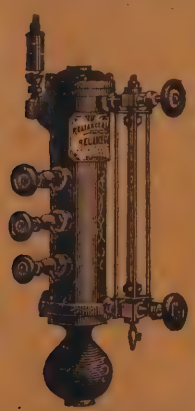
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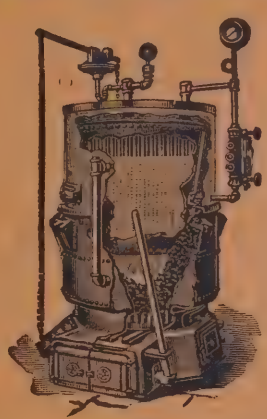
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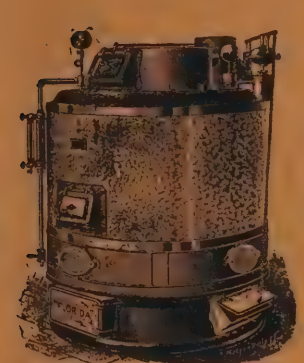
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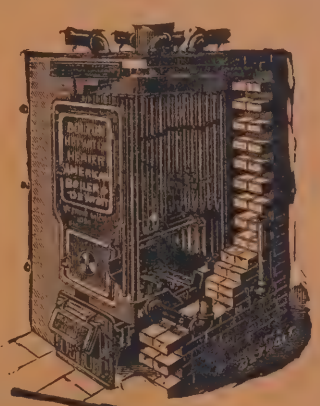
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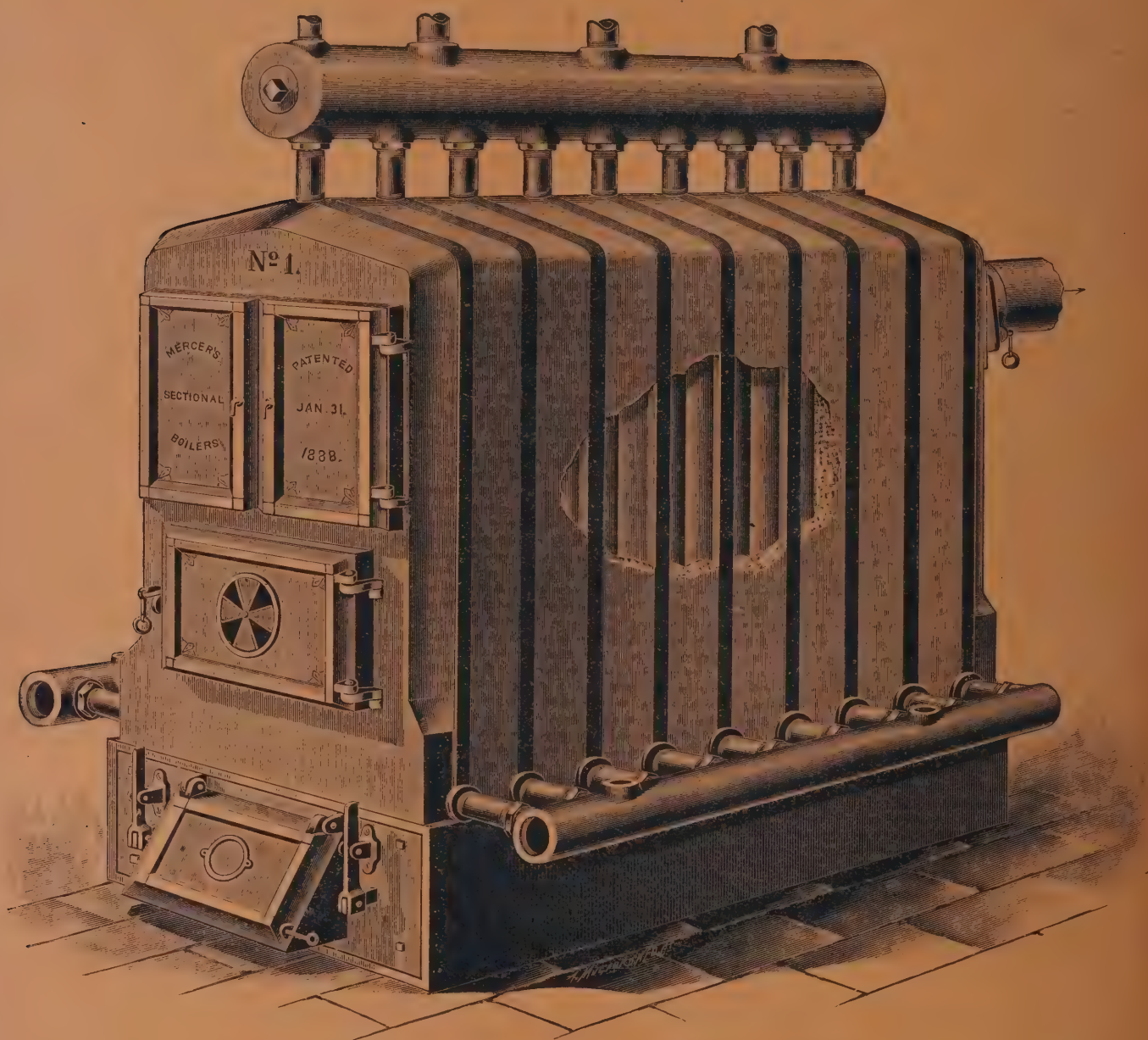
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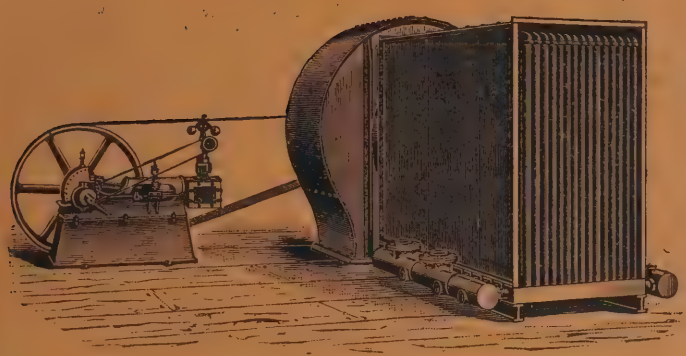
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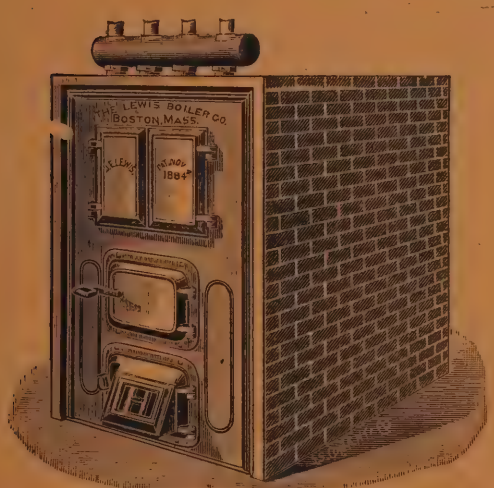
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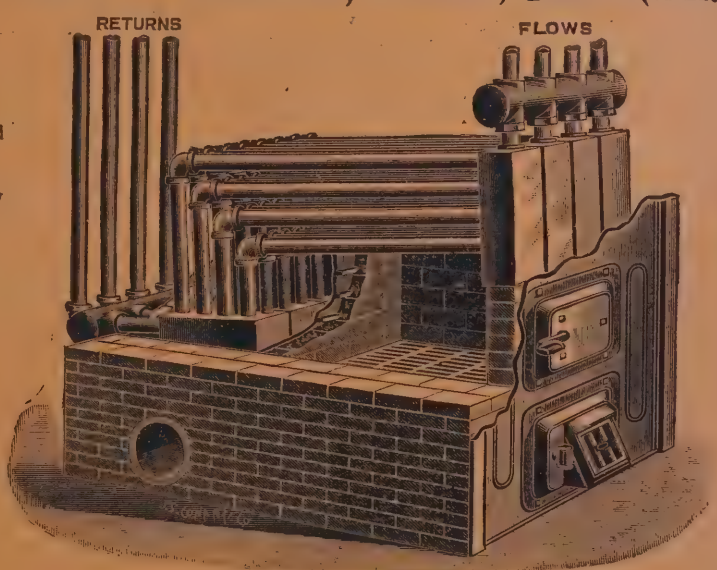
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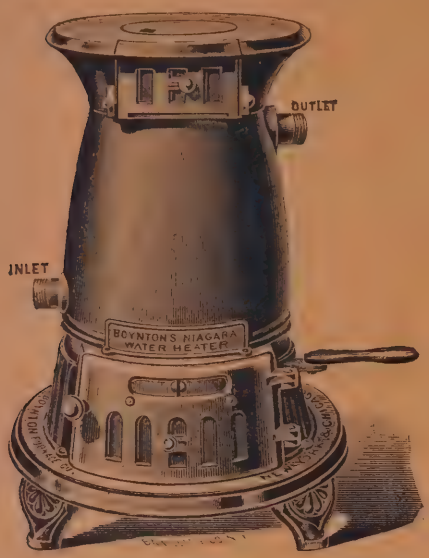


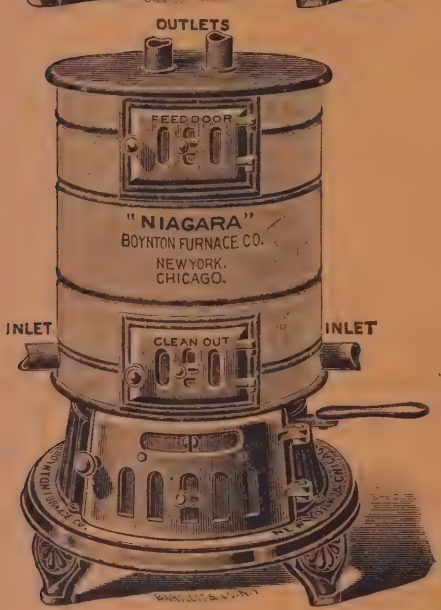
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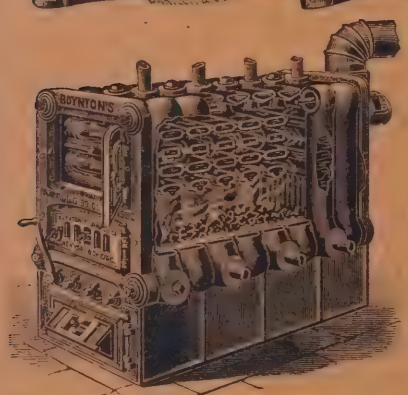
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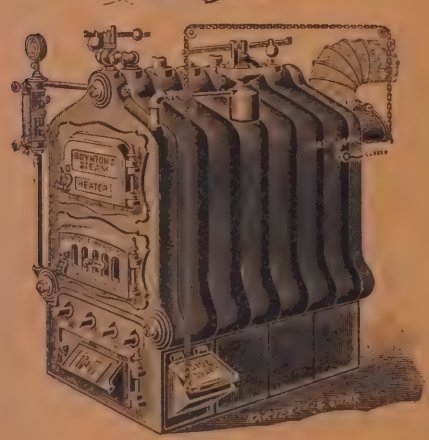
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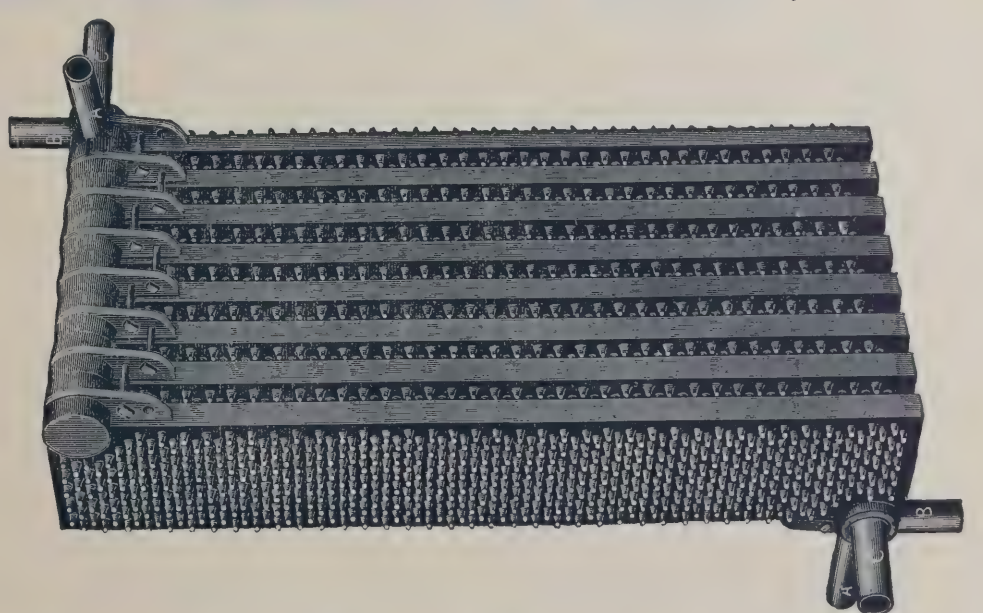
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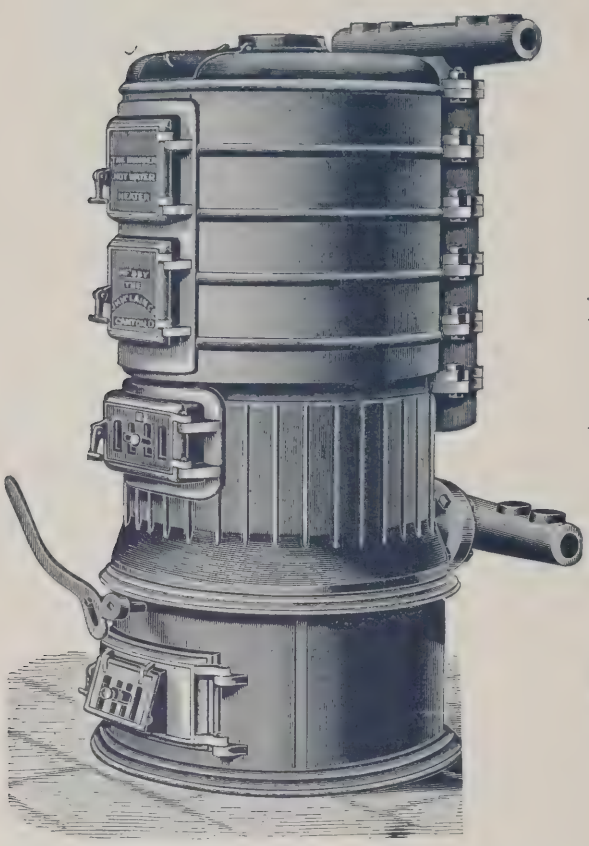
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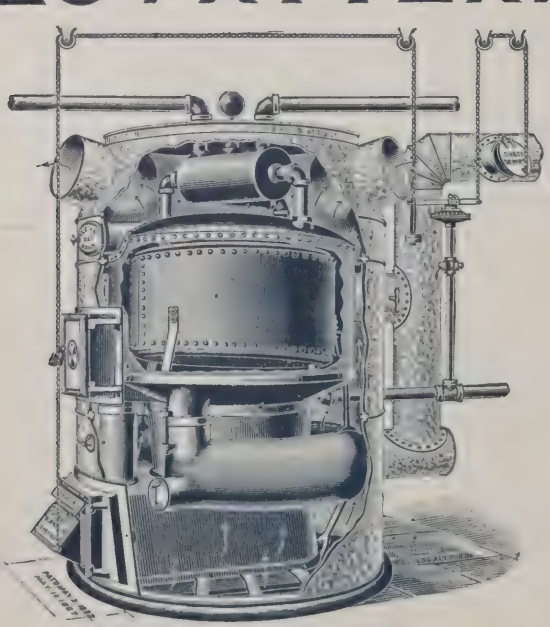
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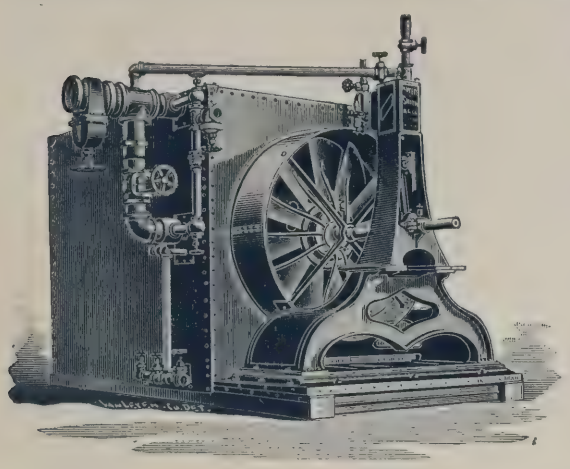
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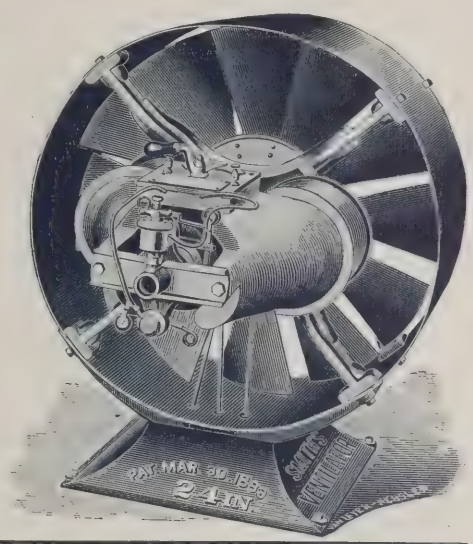
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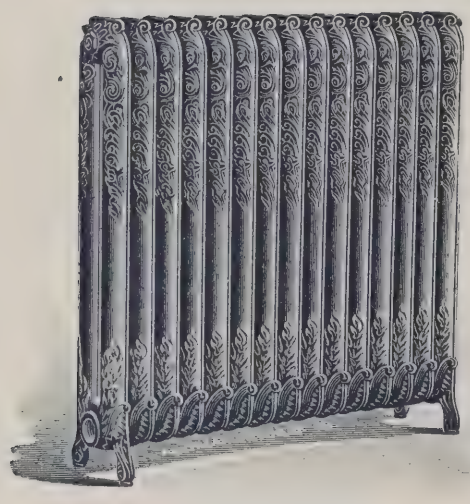
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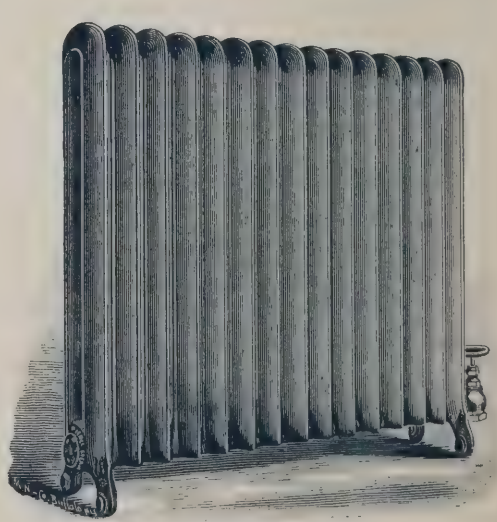
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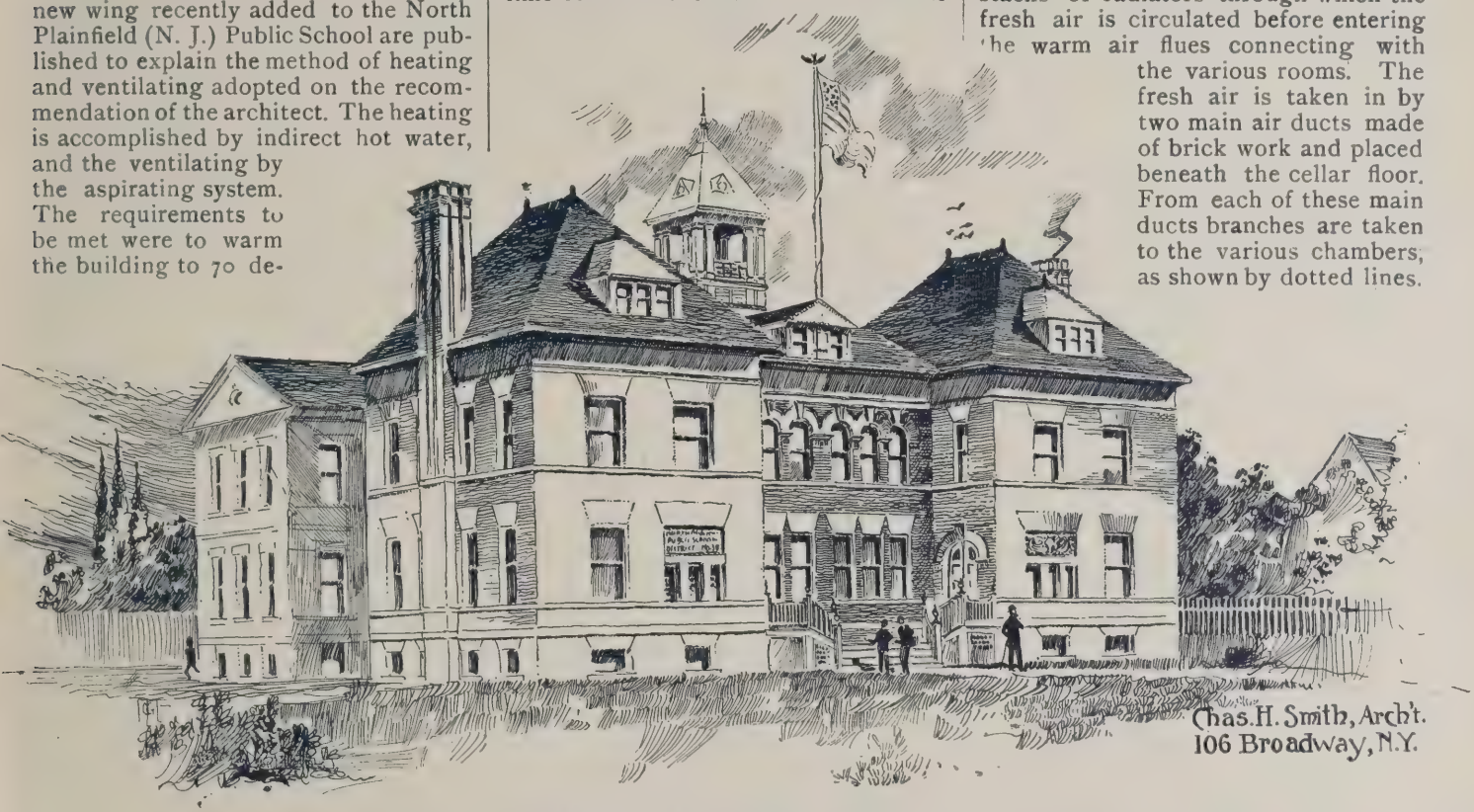
FACTORIES:
DETROIT AND BUFFALO.

Heating and Ventilation

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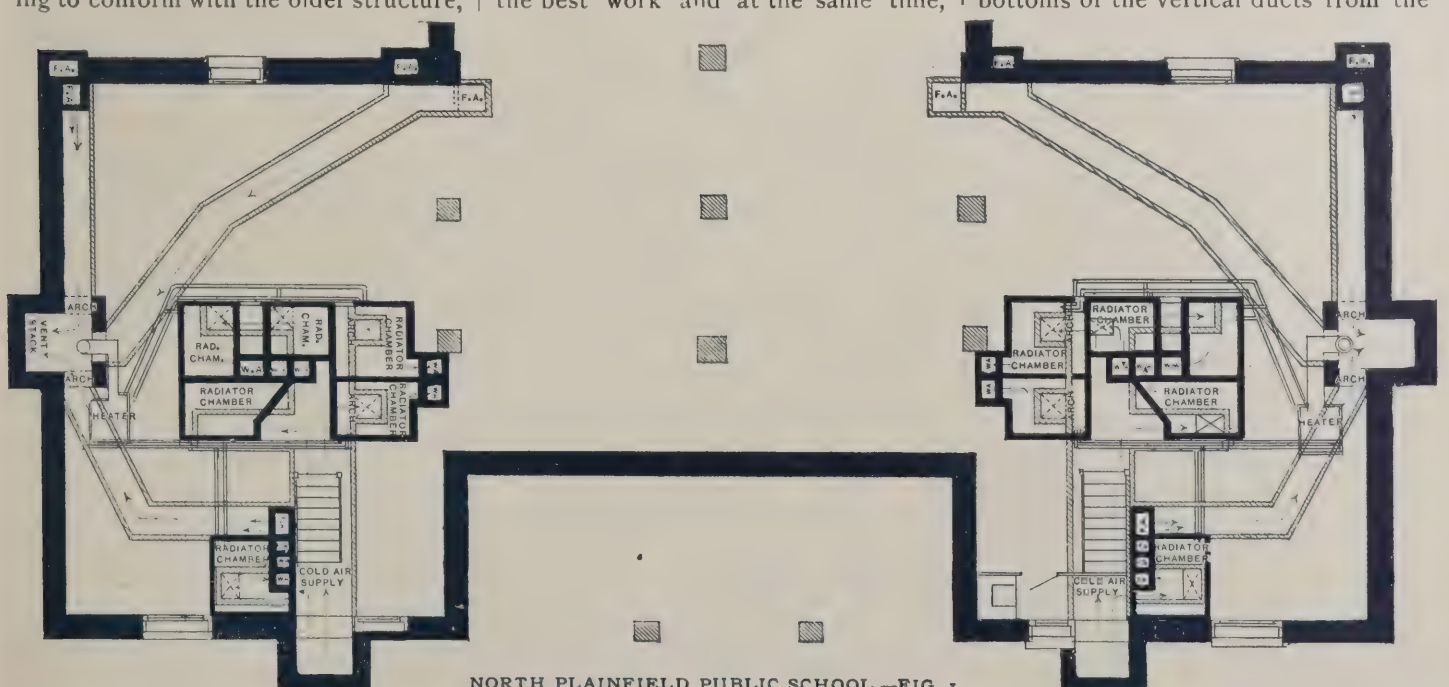
North Plainfield Public School.

The accompanying illustrations of a new wing recently added to the North Plainfield (N. J.) Public School are published to explain the method of heating and ventilating adopted on the recommendation of the architect. The heating is accomplished by indirect hot water, and the ventilating by the aspirating system. The requirements to be met were to warm the building to 70 degrees in zero weather and to change the air in the rooms from four to five times per hour. Owing to the new wing having to conform with the older structure, that all the rooms should be arranged with folding partitions, that at any time could be shoved back to make one large assembly room. These requirements made it very difficult to locate the exhaust flues where they would do the best work and at the same time, conditions were met with that would not have existed in an entirely new building; besides this it was desired that the architectural requirements of the building.



NORTH PLAINFIELD PUBLIC SCHOOL.

Fig. 1 is the cellar plan of the building, showing the location of the various chambers that contain the stacks of radiators through which the fresh air is circulated before entering the warm air flues connecting with the various rooms. The fresh air is taken in by two main air ducts made of brick work and placed beneath the cellar floor. From each of these main ducts branches are taken to the various chambers, as shown by dotted lines. The foul air ducts are built under the cellar floor in a similar manner to the fresh to air ducts. These connect the bottoms of the vertical ducts from the various rooms and to the base of the main vent shaft. Heat is supplied by two of Mott's "Sunray" water

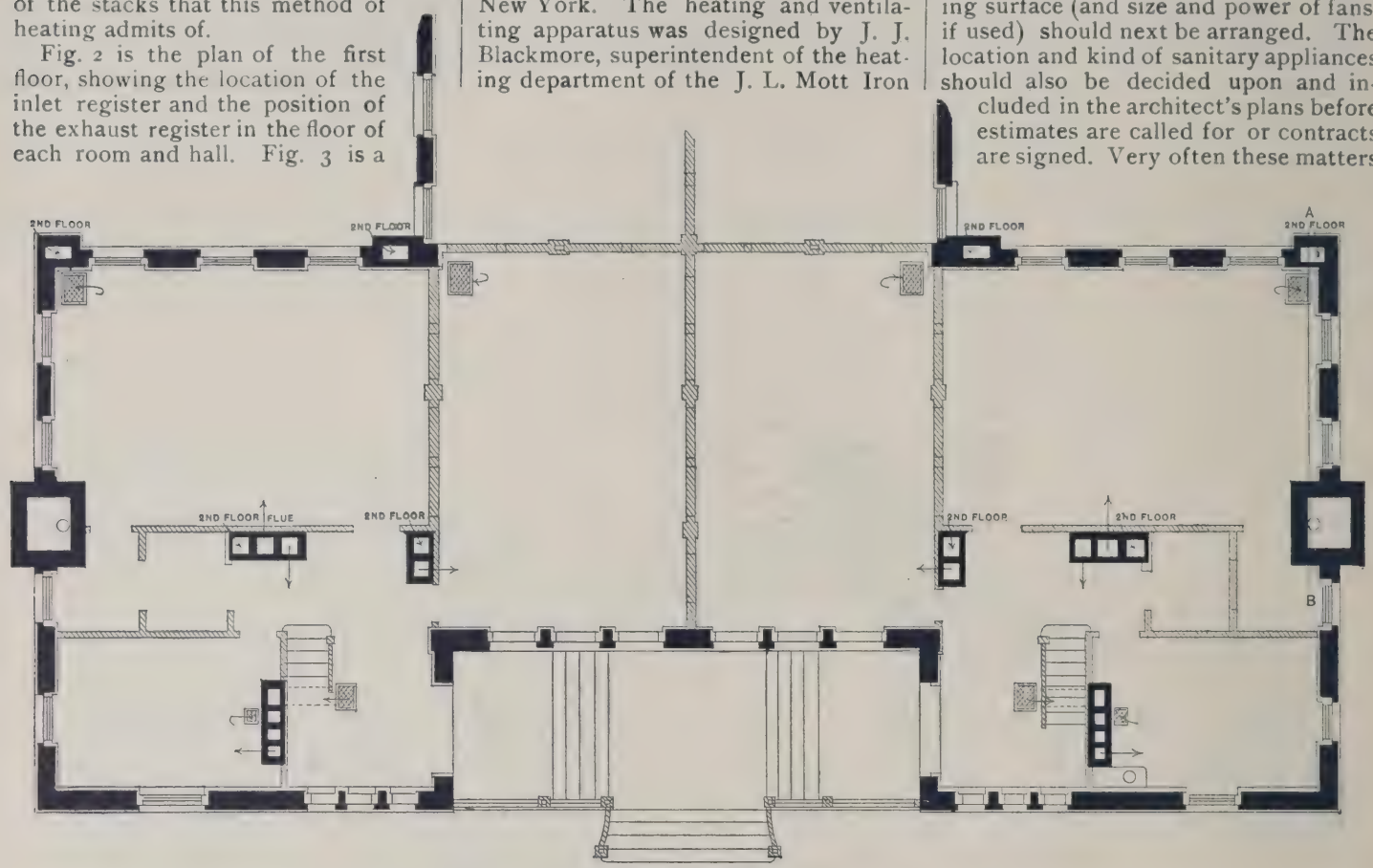


NORTH PLAINFIELD PUBLIC SCHOOL.—FIG. 1.

heaters, each having a capacity of 3,000 square feet of direct radiation. It will be noticed that the flow and return mains in a system like this are very short, owing to the compact grouping of the stacks that this method of heating admits of.

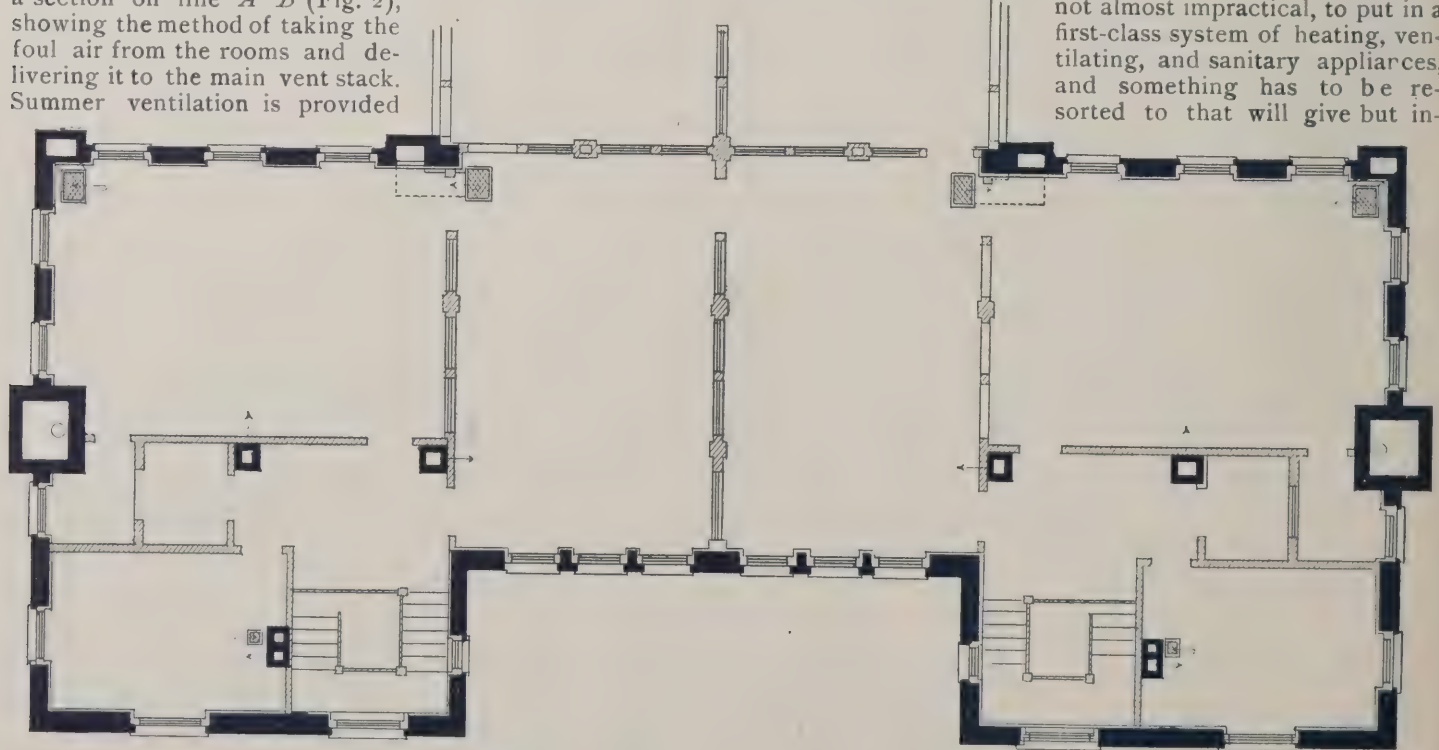
Fig. 2 is the plan of the first floor, showing the location of the inlet register and the position of the exhaust register in the floor of each room and hall. Fig. 3 is a plan of the second floor, showing flues for supplying warm air and the position of exhaust air registers. Fig. 4 is a section through the radiator stack and warm air flue, showing the position and action of the mixing damper. Fig. 5 is a section on line *A B* (Fig. 2), showing the method of taking the foul air from the rooms and delivering it to the main vent stack. Summer ventilation is provided for by placing a furnace in each of the vent stacks in which a fire may be built when the heating apparatus is not in use. No difficulty was experienced during the recent cold weather in maintaining the required temperature and in getting the needed ventilation.

The building was planned by Chas. H. Smith, architect, 106 Broadway, New York. The heating and ventilating apparatus was designed by J. J. Blackmore, superintendent of the heating department of the J. L. Mott Iron Works, New York, and the work of placing the apparatus was done by C. W. Krousse of Plainfield.



NORTH PLAINFIELD PUBLIC SCHOOL.—FIG. 2.

IN ARRANGING for the heating and ventilation of a public building, or school house, says one of the state factory inspectors of Massachusetts, it should at first be determined what means are to be used, whether fans and indirect radiation, indirect radiation without fans, furnaces, or jacketed stoves. After deciding this point, the location and size of the ducts and flues and the amount of heating surface (and size and power of fans, if used) should next be arranged. The location and kind of sanitary appliances should also be decided upon and included in the architect's plans before estimates are called for or contracts are signed. Very often these matters are neglected till after the general plant and contracts are made, and then is sometimes becomes a difficult matter to properly arrange what should have been done before. The plan may be so made that it will be very expensive, if not almost impractical, to put in a first-class system of heating, ventilating, and sanitary appliances, and something has to be resorted to that will give but indifferent results, but which will cost as much, if not more, than a first-class system would if properly arranged at first.



NORTH PLAINFIELD PUBLIC SCHOOL.—NO. 3.

Heating and Ventilation of Residences.—V.*

James R. Willett

HOT-AIR FURNACE HEATING.

Heating by hot-air furnace is a method by which air is heated by what is termed a furnace, and passed into and through the building.

The hot-air furnace is practically a stove inclosed in a casing, leaving some space between the stove and the casing.

Air, presumably fresh, is admitted at the bottom of this space, and, being heated by the furnace, it passes upward and is led through pipe ducts to various portions of the building.

We will use the formula already given:

$Q = R\,F\,J$ = cross sectional area of hot air pipe in square inches for the room in question.

The value of R should be calculated by the rule already given for radiator surface

In first-story rooms take $F = 1.4$
In second-story rooms take $F = 1.2$
In third-story rooms take $F = 1.0$

Take $J = 1.4$ for north and west exposures and 1.0 for south and east exposures.

Calculate the value of Q for each room.

In the first-story rooms the registers, through which the hot air enters, are usually placed in the floor. There are several reasons for this. The partitions of the first story are usually occupied by the flues of the second story. Furthermore, ordinarily the partitions would not be large enough to allow of the necessary area of cross section, which is required to be much larger in the first than in the second story.

Round hot-air pipes, called by the trade "leaders," run from the furnace horizontally, but with an upward pitch or slope, to the register boxes in the first floor. The upward pitch of these leaders should be made as great as is practicable. These leaders may be of a single thickness of tin, since they are entirely below the basement ceiling, and do not come in contact with the woodwork. Each leader should have a damper in it close to the furnace.

Table I gives trade sizes of leaders.

All flues, pipes, boxes, etc., of every description that may be inclosed in partitions, etc., or that may come in contact with woodwork, should be made of two thicknesses of tin, with air space between. It is also desirable that such pipes, etc., should be wrapped with asbestos felt pasted on the pipes.

The register boxes may be placed in the first-story floor and the leaders should enter them by a curved elbow, what the trade calls a three-piece, or better, a four-piece elbow. All elbows should be curved and not rectangular.

TABLE I.—TRADE SIZES OF "LEADERS" (ROUND PIPES) AND THEIR CROSS SECTIONAL AREAS.

Diameter in inches.	Area of cross section in square inches.
7	38
8	50
9	63
10	78
12	113
14	154
16	201
18	254
20	314
24	452
30	707

The vertical hot-air pipes to rooms in second story are called by the trade "stacks." These stacks have usually to pass up within the thickness of stud partitions in first story, and are largely governed by that consideration.

The ordinary stud partitions are made either of 2 by 4 inch or 2 by 6 inch studs. Therefore it is advisable that the outside thickness of the stacks should not exceed 4 inches or 6 inches as the case may be.

The breadth of these stacks is also determined somewhat by the distance of the studs apart. These studs are usually 12 inches or 16 inches between centers, leaving a net space of from 10 to 14 inches for the stacks.

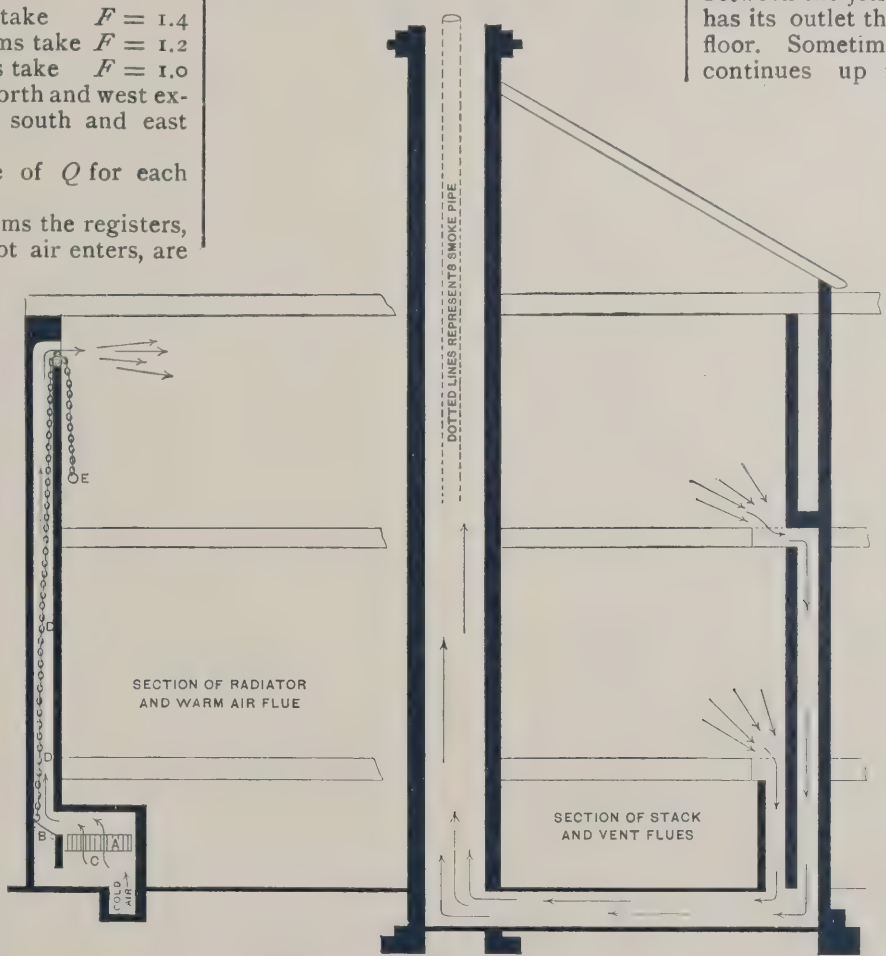


FIG. 4.—NORTH PLAINFIELD PUBLIC SCHOOL.—FIG. 5.

"The custom of placing heads on both ends of stacks and projecting the stacks into the basement and taking collars for round pipes from the side of the stack has been almost abandoned, inasmuch as it has been learned by experience, that by running the stacks down just below the floor line and attaching a boot of suitable shape to the stack, a much better circulation of air is obtained, and a neater and nicer job as well. The expense of the work done this way is no greater than by the old method, for a joint of stack is saved and the two extra heads on the stack."

The above is quoted by kind permission from the catalogue of the Excelsior Steel Furnace Co. of Chicago.

Though unusual, it is sometimes practicable to carry a stack to an upper story outside of a partition. It may be perhaps run inside of a closet or other similar place In such case it is well to make the stack round instead of rectangular.

Usually when the stack arrives at an upper story floor it is turned and run between the joists a short distance, and has its outlet through a register in the floor. Sometimes, however, the stack continues up in the partition just above the baseboard, and the outlet and register are placed at that point. It is perhaps preferable to continue the stack up in the partition to seven feet above the floor, and to place the outlet and register there

The connection between the furnace and the end of an upper story stack below the basement ceiling is made by a horizontal leader pipe the same way as described for the first story.

It is frequently impracticable to make the stacks to the second and upper stories as required by calculation on account of the partition not allowing thereof. In such cases it is well to enlarge the hot-air flue to the hall in the first story to the amount of the deficiency.

The registers for any story should be made fifty per cent larger than the sectional area of the pipe with which they connect, or rather than the calculated area of said pipe. That is, add fifty per cent to the calculated area of the pipe, and the result will be the gross area of the register that should be used.

Wall registers should be convex registers.

There are a great number of patterns of registers made, too numerous to be given here. There are also different styles of finish for which see manufacturers' catalogues.

* Extract from an address delivered before the Engineering Societies of the University of Illinois, reprinted from the Inland Architect. Copyrighted, 1893, by the author.

TO FIND THE GRATE AREA.

Find the value of Q for each room and then their sum will give the value of Q for the whole house. Consider this Q as radiator surface and find the corresponding grate area in Table II.

TABLE II.—PROPORTION OF GRATE SURFACE TO RADIATOR SURFACE.

Square feet of radiator surface.	Square inches of grate surface.
100	120
200	208
300	288
400	362
500	433
600	501
700	567
800	630
900	693
1,000	754
1,100	813
1,200	872
1,300	930
1,400	986
1,500	1,040
1,600	1,100
1,700	1,150
1,800	1,210
1,900	1,260
2,000	1,310

It is important to keep a low fire in a hot-air furnace since the heated metal comes in direct contact with the fresh air and may, as it is called, "burn" it. Therefore it is better to take as large a grate area as is called for by table. A powerful furnace does not need to be run up to a high temperature and will not burn any more coal than a small furnace will that is run at a high temperature.

The most desirable pattern of furnace to use can only be ascertained by examining them.

In order that the heat generated by the fire may be communicated to the air in the hot or fresh-air passages of the furnace, it is necessary that the surface between the fire or smoke passages of the furnace and the hot, or fresh-air passage, of the furnace shall be large in quantity. The more the better. It can scarcely be too much.

This leads to more or less winding around of these passages, with usually also a direct and short passage intended for use when a fire is first started, but which should be closed by means of a damper as soon as the fire is fairly under way, and the draft forced to take a circuitous route.

If the furnace has not circuitous passages, but only direct communication with the chimney, then there will be less opportunity for the heat to communicate itself to the fresh-air passages, and more of the heat will go up the chimney, in which case the grate would need to be larger.

The desire is to wind the smoke-passages about through the fresh-air passages so there will be an opportunity for a large portion of the heat which is in the smoke flues to be communicated to the air in the fresh-air passages before the smoke passes up the chimney. But the passages must be arranged so as not to readily choke up by soot, and so that they can be cleaned out.

The firepot of the furnace is usually of cast iron, but it would undoubtedly be better if the firepot was surrounded by fire tile or brick so that the air in the fresh-air passage may not be exposed to the iron surface at a red heat, as is very often the case in cold weather.

The furnace should be placed on the side of the house against which the prevailing winds blow (north and west) and in other respects as near central as practicable.

If the supply of fresh air to the furnace is to come wholly from the fresh-air inlet, then it will be found at times that it is difficult to heat the house.

Some other means, therefore, must be taken to supply additional air to the furnace. The best way, perhaps, is to have a duct running from a register, opening in the floor of the hall, near the entrance door, down to bottom of the furnace. This duct should not enter the furnace opposite to the fresh-air inlet opening, but should enter parallel to the fresh-air inlet. Otherwise, the air from one inlet might pass out of the other. The partition between the two inlets should extend some distance into the furnace, so as to prevent this from occurring. The register in the first floor communicating with this—what we shall call "circulating pipe"—should not have valves upon it. And the hot-air pipe from the furnace to the hall should also have a register face without valves. This will allow of a constant circulation of air, and prevent the house from getting cold.

There is another advantage: when the weather is but slightly cold, the house is apt to become too warm, and the registers would probably be closed. There being no egress for the air heated in the furnace, it is apt to become dangerously hot, and thereby cause the house to take fire. By means of a circulating pipe and a hot-air pipe to the hall, neither register having valves upon it, the circulation cannot be wholly stopped, and the hot air is thereby prevented from attaining a dangerous temperature.

The area of this circulating pipe should be one-half of the cross sectional area of the fresh-air duct.

Rooms that are distant horizontally from the furnaces are very difficult to heat. This difficulty has given rise to what is called a "combination method" of hot water and hot air; the hot-water apparatus being used to heat the rooms which are distant, horizontally, from the furnace. The boiler is placed inside of the furnace just above the fire, and from it hot-water pipes lead to radiators which are located in the distant rooms.

The greater portion of the residence is heated by hot-air furnace, and the hot-water apparatus is subsidiary thereto; consequently, the grate is far larger than would be required for the hot-water boiler alone, and the hot-water boiler being inside the furnace is necessarily small. In cold weather if the fire be pushed, the water apparatus being small, steam is likely to be generated and the water driven out of the apparatus. To remedy this, it is necessary that the radiator surface should be large compared with the boiler surface, and the pipes full size, so that the water may be readily cooled off and the formation of steam prevented. Valves should not be used, as the circulation should not be stopped.

Some boilers are constructed so that they can readily be made smaller, and thus the heating surface in the boiler reduced. This is effected by removing certain parts of them which are made so that they can be detached.

Indirect or Hot Air Heating.

J. H. Kinealy.

The indirect or hot air system of heating does not appear to be as much in favor as the direct steam or hot water systems. It is urged against the hot air system that it costs more and often does not heat as well as it ought. The first objection is well taken if heating alone is considered, but not if ventilation as well as heating is desired. The second objection has no force if the system is properly planned and proportioned for its work.

The great beauty of a hot air system is that it cannot possibly work in a satisfactory manner unless there is a pretty fair system of ventilation. Mr. James A. Harding struck the key note when he said, in HEATING AND VENTILATION of February, when speaking of defective circulation in connection with hot air furnace work, "Ventilating (by exhaust) the room is the best remedy for defective circulation."

When I say "hot air heating" I want to be understood as meaning a system in which the heating is effected by introducing into the apartments to be heated a quantity of hot air. The air may be heated either by a hot air furnace, or by indirect steam or hot water heaters.

Let it be assumed that one square foot of direct steam radiation surface will give off 330 heat units per hour, to determine the number of cubic feet of hot air that will be required to do the same heating as one square foot of direct steam radiation surface. It will be further assumed that the hot air enters the room at 140 degrees F. and is cooled to 70 degrees.

One pound of air will give off 0.238 heat units in cooling 1 degree, and in cooling 70 degrees will give out 16.66 heat units. To give out 330 heat units there will be required then, $(330 \div 16.66 = 19.81)$ about 20 pounds of air per hour to be admitted into the room at a temperature of 140 degrees.

One pound of air at 140 degrees will occupy a volume of about 15.1 cubic feet, and 20 pounds will occupy say 300 cubic feet. If the direct steam radiation surface were proportioned in the ratio of one square foot of heating surface to 80 cubic feet of space, it is seen that to warm the same space by hot air at an initial temperature of 140 degrees, it would be necessary to fill the room $3\frac{3}{4}$ times per hour with hot air. That is, the room would be filled with hot air once every 16 minutes. This, in itself, would afford a pretty fair ventilation, as, if the room had been designed to afford 200 cubic feet of space to each person, it would give 750 cubic feet of fresh air at an initial temperature of 140 degrees per hour for each person. While it is true that this is not as much

as is often required, or as may be desired for good ventilation, still it is a great deal more than is often obtained.

Of course, the running expenses of the hot air system would be more than for the direct steam system. A part of this increase in expense would be accounted for by the ventilation afforded, and a part by the difference in the efficiency of the two systems. This last item may or may not count against the hot air system. Where there is no special arrangement for ventilation in the way of fans no system of heating will give such good results as the hot air system. And where no great amount of ventilation is required, a combination system of hot air and direct radiation will usually give the best results for the money spent in running expenses.

The main and great objection to the hot air system when the air is heated by a hot air furnace, is that the air is so apt to be heated too hot and made very dry. Of course the higher the temperature of the air when it enters the room to be heated the less will be the amount of air required.

Opening the windows of a room heated by hot air always deranges the circulation of the air in the room and may affect that of the whole system, and if the system has been properly designed and planned, such attempts to aid the ventilation are apt to do more harm than good. Where a system is not properly designed or the ventilation is entirely inadequate, however, it is sometimes advantageous to thoroughly air out everything and take a new start, once or twice a day.

When a hot air system gives unsatisfactory results, see if there are proper facilities for ventilation before condemning it, and remember that the hot air cannot possibly enter unless there is provision for the escape of the cooled and vitiated air.

School House Heating and Ventilation.—II.

W. D. Dickson

In the preceding article on this subject I called attention to the bad effects of impure air in schools, deprecating the disregard for or the neglect of the commonest sanitary regulations.

The trouble is that in the construction of our public buildings regard is had only for the exterior, and the man who can get up a pretty plan is the best fellow. The result is that our courts and our court rooms are totally unfit for the most part to speak in; and our schools are simply places for disseminating disease, instead of acquiring information.

A sound mind is inseparable from a sound body. We are beginning to pay some little attention to physical culture, but physical culture itself must be based on pure air. This is one of the first requisites. There ought to be a general law passed requiring every public building, and especially every school house, to provide the inmates with at least 2,000 cubic feet of air per hour, and no building ought to be accepted by the state and occupied as a public school that does not do this. It costs no more to do it than it does now to build the costly, wasteful, and harmful architectural coops that are dignified by the name of public schools.

There is deplorable ignorance in the public mind upon this subject, and the only way we can arrive at results is to insist that certain points must be guarded. We do it now in a degree, with a general law that the doors of all public buildings must swing outwardly, and this measure has had the happiest result. It is one of the first things that the public look to in the erection of a building. The other matter of pure air is of far more importance, and ought to be regulated in the same way.

A MOVE IN THE RIGHT DIRECTION.

The National Convention of School Superintendents just held at Richmond, Va., passed the following important resolution: *Resolved* that each state should by law provide for the proper ventilation, lighting, and heating of each school, and that there should be at least 1,500 cubic feet of fresh air provided for each pupil per hour.

This resolution received the unqualified indorsement of the whole convention, and was signed by all the members of the committee, consisting of N. C. Shaeffer, superintendent of schools of Pennsylvania; C. R. McMurray of Normal, Ill.; Henry Raab, superintendent of public instruction of Illinois; L. H. Jones, superintendent of schools of Indianapolis, Ind.; and E. R. Reeves, superintendent of schools of Florida.

This is a move in the right direction. Now there should be a law describing the way a school room should be built to accommodate 50 pupils. When this is done the whole ground is completely covered.

The same general rule applies to lighting as well as heating and ventilation. If good light in a school be a benefit and it can be obtained without cost, why should a school be built without it?

It is now generally conceded as an understood principle that the light should come from the left of the pupil when seated. Yet so simple a thing as this is neglected in almost every school in one or more rooms. It is done in some cases through ignorance and in others from a desire on the part of the architect to make a pretty elevation in order to please the fancy of the board.

It will be readily seen that if the light comes into each room from the left of the pupil when seated it will throw the window on the side of the room in place of the end. And as the end of some rooms will come in front, it is a difficult matter to make a nice looking building with these wants provided.

Rather than sacrifice the looks they sacrifice the light. The law in question will prevent this, and it should recommend itself to every one, for there is nothing more important in a school room than good light. Perfect light can be obtained in every room in a school, no matter how large or how small, if the architect making the plans knows that the law requires the light to enter the room in a certain way with reference to the seating.

The architect, if guided by the law, would get the correct light first. Then if anything had to be sacrificed it would be the elevation. Architects who procure contracts for schools by drawing pretty elevations and nothing else would be handicapped a little, but they would soon learn that they must comply with the new order of things. They would easily adapt themselves to the conditions.

School boards that are not familiar with school work would hail with delight a law of this kind that would lay down rules for their guidance. They could not go far amiss. To manipulators of school boards, owners of patent plans, and the like, it would say, "Thus far shalt thou go and no farther. You cannot jeopardize the health of the young by any experiments."

The result would be perfect school houses. Such a law is greatly needed, and let us hope that it will soon be universally adopted.

Bronze Powder.

The United States Commercial Agent at Furth says that the greater part of the bronze powder exported from Germany is manufactured in and near the cities of Furth and Nuremberg, about a hundred establishments being engaged, the factories being generally situated on some small stream, where water furnishes cheap power for driving the hammers and stamps. Bronze powder is composed of copper, tin, zinc, and antimony melted in proper proportions, and cast first into rods of half an inch in diameter and about three feet long. These rods are rolled until about two inches wide and then cut into suitable lengths for handling. These pieces go to the hammers, where they are beaten into a very small fraction of their former thickness and, are then taken to a sulphuric acid bath, where each sheet is washed to remove all impurities, rust, and dirt. After being thoroughly dried, the sheets are again hammered by steam-hammers until no further reduction is possible, there being a limit to which machinery can be used. Up to this stage the treatment which the metal receives, whether intended for metal leaf or powder, is identical; but now the process changes. If designed for metal leaf, the further beating must be done by hand, but if for bronze powder, the sheets go to the shears, where they are cut up into small particles, and become known as clippings. These are now ready for the stamp mills, which are run in batteries, enabling one man to run or attend fifty or more. When sufficiently pulverized, the powder is sifted in a peculiar manner, the heavier and better qualities going to one receptacle and the inferior grades to another. The cheaper qualities are mixed with quartz powder, to enable them to be sold cheaply. The expense of manufacturing bronze powder rests largely in the production of the clippings, a great deal of handwork being required.

Warming and Ventilation.—I.

Geo. W. Kramer

CONSIDERED FROM A PRACTICAL STANDPOINT.

So much has been said and written about heating and ventilation that the general public has been led to consider it an abstruse and difficult matter, but this is a mistake. The application of common sense and mechanical knowledge, in connection with natural laws, will render the problem easy. Most persons seem to understand the general laws governing, and yet everybody, from the janitor who makes fires to the scientific genius who invents the "perfect sanitary heating and ventilation apparatus" especially adapted to all purposes, seems to ignore them in practice.

Heating and ventilating are so intimately connected and mutually dependent one upon the other that it is hardly possible to consider them separately. Satisfactory heating largely depends on perfect ventilation, which may be divided into natural and mechanical systems. While the laws of nature are fixed, the governing conditions are constantly varying, hence with natural systems a uniform ventilation is impossible.

When the building to be ventilated is considered as a tank filled with air, sunk at the bottom of an ocean of air forty miles in depth, the conditions governing will be appreciated. To use a common phrase, air when warmed will rise by its own levity. This is a mistake. Air when the temperature is raised becomes rarefied, consequently lighter; the denser and heavier air presses beneath it and raises it as if borne on its shoulders. An equal amount of colder, denser air rushes in to displace the warmer air. The lower strata of air, except in rare cases, is the denser; hence the danger arising in natural ventilation of the supply being drawn from stagnant alleys and areas, especially in a city where undoubtedly the pure air comes from higher levels.

When air is artificially warmed and introduced from the apparatus, the conditions are to a certain extent reversed. The fresh air entering is at the higher temperature, hence will be crowded out at the top unless provision is made for its retention, by exhausting the colder air from the bottom of the room; as no matter how introduced the warm air will fill the higher places first, and can only be persuaded to descend when the colder stratum that supports it has been withdrawn. This can be done by mechanical means, or by ventilating flues.

The mere *provision* of flues, even if ample, will not solve the problem. The air in these flues must be heated beyond that of the rooms with which they are connected, or nature will not cause the air from outside to flow in and raise it. On the principle that a pump will not work unless some one works the handle, the flue will not draw unless this difference in temperature is maintained. Some go on the supposition that a current once started will work happily forever after. With *fixed* conditions the laws of nature might be so applied as to secure this result.

Whether the ventilation be left to chance, or whether any special apparatus be erected for the purpose, foul or vitiated air must be got rid of and fresh air adapted to the purposes of respiration must be admitted in sufficient quantity. By some, artificial ventilation is divided into two branches, *plenum* and *vacuum*. By the first the fresh air is forced into the interior of the building at such impetus or in such quantity as to compress the air in the room and assist or compel the efflux of the vitiated air through ducts properly located and proportioned. By the second the vitiated air is withdrawn from the building and fresh air finds an entrance through channels adapted to the purpose.

In withdrawing vitiated air, it must be observed that some noxious gases do not rise; others will when the air is at a certain temperature, while with a higher temperature they will fall. Thus sewer gases uncontrolled will exercise a more extended action laterally in hot weather, while in cold the tendency will be to rise vertically. In addition to ordinary sewer gases there are gaseous emanations from the earth which are largely governed by the same laws, of which there will be more extended mention later.

The carbonic acid emitted by the respiration and by lights being of a greater specific gravity than atmospheric air, would at the ordinary temperature tend to accumulate in the lower strata, but the temperature of these products is generally such that they will first rise and diffuse through the air unless influenced by properly arranged ventilating currents.

Every building provided with a system of artificial ventilation should have it operated sufficiently after occupation to insure a complete change of air, to avoid a deposit of the foul emanations on the walls or furniture, which is the cause of the unpleasant condition of rooms which remain closed for a time after occupancy.

The means of ventilation must be cheap, easily obtained, always in place, simple of operation, and not liable to get out of order. One advantage of the plenum system in combination with heating—as it always should be—is that the source of supply of fresh air is always controllable, and that the system if not in operation gives its own alarm by a cessation of the supply of fresh warm air; while with the natural system there is nothing to give warning of an inoperative flue, or even if one reverses. With the vacuum system, while the air is positively removed when in operation, the source of supply is not controllable; air will come from the source of least resistance,—from an area, alley-way of stagnant foul air, basement, cess pool, or may be a sewer.

Heat as required in architectural structures results from raising the temperature of the air by means of various contrivances so arranged as to take advantage of the laws which govern the transmission of heat. All heating apparatus depends on the transferrence of heat from the fire to the various parts of the building which is to be warmed. This transfer may be effected by radiation, conduction, or convection. The methods of producing heat may be classed as open fires, closed fires, hot water, and steam.

Radiant heat is emitted and absorbed in an accelerating ratio in proportion as the difference of temperature between the radiant and the recipient increases. An open fire acts by radiation, first warming the walls, floor, and ceiling; these in turn warm the air, therefore the air is less heated than the walls. The heat received by the wall divides into two parts, one heating the air in contact, the other passing through to other surfaces, where it is dissipated and wasted, the proportions varying according as the material of the walls is a good or bad conductor or radiator. In some grates, bars are inserted extending into the fire, the ends projecting for the purpose of conducting heat to the air also.

A stove or furnace is an example of a closed fire. Moderately heated it acts as a conductor, the heat passing from the fire to the materials of the stove being transferred to the outer surface in contact with the air, which is heated. If heated to a high temperature it will give out radiant heat, which passes through the air to warm objects on which it impinges. A high temperature, however, will repel air in contact, hence a high temperature is not of advantage to a conductor.

With steam the fire first heats the metal, which conducts the heat to the water, which absorbs sufficient to vaporize and must also absorb and retain sufficient energy to convey this vapor or steam to the apartments, losing in metal conduits. It then heats the interior of the metallic radiator, is conducted to the exterior, and given off to the air. Results depend on the amount of heat evolved by the fire, the extent of surface exposed to the heat, the capacity to absorb and emit, the quality or character of materials as good or bad conductor, etc.

This passage of heat through a body by conduction varies directly with the quality of the material and the difference between the temperature of the surface exposed to heat and the surface exposed to cooling, and inversely as to the thickness of metal between surfaces. All materials differ in their qualities as to radiation or conduction. Density is the essential quality of a good conductor, while porosity is that of a good non-conductor.

Convection of heat is the principle of conveying currents of heated air to the various localities or apartments it is desired to heat through conduits prepared and placed for the purpose. Many other qualities, conditions, and principles govern, which must be recognized and considered in connection with the practical and successful installation and operation of any heating and ventilating plant.

The most common error in regard to warming is to estimate solely with reference to the economical combustion of the fuel and the heat-producing

capacity of the apparatus. Ventilation cannot be effected without expenditure of fuel or energy. Proper and perfect ventilation is impossible unless our buildings are so constructed as to permit of the best processes being carried out in their integrity.

The most perfectly arranged building and the most efficient apparatus cannot be made automatic. Much depends on the person in charge. No apparatus can be provided with brains, and it is short-sighted economy that will go to great expense to provide every facility for perfect warming and ventilation, and place the apparatus and system in charge of some person whose only recommendation is that he is a deserving man and will work for less than men with more brain or common sense.

This can best be illustrated by the reply of the chief engineer of the Houses of Parliament, when explaining the ventilating apparatus, who says, "After all, the perfection is in the fact that my assistants have been here for years, and know how to regulate air and temperature according to the indications of outdoor air and indoor circumstances."

As there are many entirely different characters of buildings to be warmed and ventilated, each should have its own special application of the system and method best adapted to the individual requirements. For convenience, all buildings can be included under one of several classes, and as many special systems or *varieties* of *one* system should be considered in connection.

The foregoing is general and prefatory; the remainder of this article or series will be more of a specific nature. Practicing in a special line or department of architecture, my object has been to secure or adapt the systems and appliances to the particular requirements, endeavoring to secure the most perfect and satisfactory results in the most economical way.

Extended practice and experience has enabled me to thoroughly test the various systems now in the market. Coming into direct contact with the representatives of the various systems, and endeavoring by their co-operation to secure the most satisfactory results, has enabled me to make comparisons and arrive at conclusions from an unbiased and unprejudiced standpoint, which may be of interest and value to others, and may enable them to avoid to a certain extent traversing the same tedious pathway of experience.

In the papers to follow this one will be given the course of reasoning which resulted in certain conclusions, the experimental introduction of theories into practice which has produced some results gratifying and encouraging beyond my most sanguine expectations, which is an exception to the general rule governing experiments.

THE use of the hot water system for church buildings has been looked on in the past as a good deal of an experiment, and many have doubted the advisability of its adoption; but its successful operation in some cases has demonstrated its advantages.

Method of Warming Buildings.—II.

J. J. Blackmore

Having in the preceding article compared the value of fire surfaces surrounded by water, and similar surfaces surrounded by air, for the purpose of absorbing heat, we will now consider the difference in the methods of distribution. In the operation of a hot air furnace we have to depend on the air for the entire work of distributing the heat through the building, and as this has to be taken from one particular place, it follows that some rooms will be much easier to heat than others, it also follows that it will be easier to heat the south side than the north, and the same may be said of the sheltered side of the building as against the windy or exposed side. As it is also natural for warm air to rise, it follows that the upper floors will take the heat better than the lower ones; in other words, air is a very erratic substance to deal with and is very difficult to control; this being the case, we have to lose a large percentage of the heat in our efforts to make the air do work under adverse conditions. We cannot overcome force without generating one superior, and the force necessary to carry warm air to the exposed or windy side of a house represents the loss in fuel over and above that which is necessary to produce the required heat.

In the use of an indirect hot water or steam heating apparatus we have the advantage in being able to place the heating stacks directly under the rooms to be heated. We thus require the air to travel only in an upward direction, the one most natural when heat is being imparted to it; we thus avoid the loss that is occasioned by having to carry it in long horizontal pipes, often against an opposing current that is difficult to overcome.

In indirect hot water or steam heating we distribute the heat in all the horizontal runs by a force that can be easily controlled, only depending on using the air when we can use it to the best advantage. We have also the advantage of having a separate heating chamber for each room so that one room cannot draw from the other. The indirect hot water or steam is always under control and is consequently cheaper and easier to operate.

In comparing hot air heating with direct hot water or steam the contrast is much greater, for in this case we have steam and water almost entirely under control and can send it where and when we please, no matter what the climatic or atmospheric conditions may be.

So far the comparison has been between hot air and steam or water, we will now endeavor to make a comparison between hot water and steam heating. In using steam we require heat to change the water into vapor and we require heat to develop the power necessary to perform the mechanical effort of distribution to the several parts of the apparatus. The power necessary to send the steam to the different parts of a system of heating varies from twenty to forty per cent according to the distance of the various parts of the plant from the boiler room and the care with which the piping is planned and erected.

In the use of a water heating apparatus we use no power for the development of latent heat, while gravity supplies the power necessary for the transmission of the heat to the various parts of the apparatus. The moment we heat water in one part of the system it rises and displaces the colder or heavier water in the upper part of the apparatus.

In summing up we remind the reader that there are certain forces of nature that govern the production and diffusion of heat, and the apparatus that works mostly in harmony with these natural forces is the most economical and easily managed.

Observations go to prove that direct hot water is forty per cent cheaper than hot air in performing the same work. Direct steam is thirty per cent cheaper than hot air, and the indirect about twenty-five and twenty per cent cheaper.

Of course poor work in hot water or steam heating compared with good work in hot-air heating would materially alter these proportions, but we have assumed that all systems would be equally well erected and under equal conditions.

THE system of heating by hot air as used in houses of business and large buildings in France is not altogether agreeable. The air is often forced through a calorific arrangement, and it roars through the grating, much resembling the rushing of the wind, but if a person happens to stand over the grating, it means partial suffocation. The rooms are often unpleasantly heated, and the forcing of large currents of air into them causes drafts. A gentleman of our acquaintance, carrying on business in Paris, recently complained of this system of warming his office, and said he was compelled to keep a large fan-light open in order to allow of the escape of the over-heated air. Colds and other troubles were caused by the drafts, and altogether his position was not an enviable one. As he is a director of an electric supply company in Paris, he intends introducing electric heating, and using it in his office, and he gives it as his opinion that there is likely to be an enormous demand for this apparatus, as the advantages are so obvious. At the present time electricity is used to a very large extent in Paris for cigar lighters, curling-iron heaters, and cooking arrangements on a small scale, but the electric supply companies are doing their utmost to bring the cost of current within the reach of their customers for every purpose, particularly during the daytime. Motors have been tried and used to a considerable extent in places of business, but in private houses there is very little use for motive power. Everybody requires food and warmth, and in France, where house space is so valuable, anything that will warm or cook in the ordinary rooms available is of considerable value.—*Ex.*

The Arrangement of Returns in Heating Systems.

Among the great variety of questions submitted to us regarding the construction of boilers, the installation of steam plants, and the erection of boiler connections and piping, says the Locomotive, is one in reference to the use of check-valves in the return pipes of heating systems with gravity returns. Usually the amount of detail sent is too little to enable us to fully understand the existing conditions; but, generally speaking, check-valves should be placed in the main returns near the boiler, so that should there be a failure in the piping or radiators the water would not escape from the boiler.

When two or more boilers are used on the same system, and connected with the same return, there is quite a difference of opinion among engineers regarding the proper arrangement of check-valves, some contending that the individual return connections to each boiler should have separate checks, while others hold that a check in the main return, before the branch connections are taken off for the separate boilers, is all that is required; this difference of opinion being due to a corresponding difference of opinion respecting the best means of maintaining a uniform water level in all the boilers. Both of these arrangements have good points; and, on the other hand, a partisan of either of them can find objections to the other system, or, in fact, to any system not used by himself. Now, while honest discussion and criticism are proper and legitimate, it might as well be confessed that either arrangement of the checks will be found to work satisfactorily if the system is otherwise properly designed and proportioned and properly put together; but the "if" should be given its full emphasis, for with a check in the main return only, and with no equalizing pipe connecting the boilers, there would be great danger of the water backing out from those boilers under which there were good fires into others having duller fires, or fires that were being cleaned, or that had been freshly coaled. Fig. 1 shows two boilers connected to a common return pipe, and having an equalizing pipe between them. This equalizing pipe should be of about the same size as the main steam connections, and should not have steam drawn from it for any purpose. The equalizing pipe should be taken off from the boilers at a point as far removed as practicable from the point of exit of the main steam connection, in order that the pressure in it may be influenced as little as possible by the drafts of steam into the main steam pipe. A valve is placed in the equalizing pipe between the two boilers, to be closed only in case one of the boilers is out of use. When both boilers are put into service again, particular care should always be taken to open this valve first. This precaution must never be neglected.

Fig. 2 shows an arrangement of the returns, in which the branch returns to the individual boilers have each a check-valve and a stop-valve, the returns being so located that the pipes can be effectually drained when they are not in use. This latter feature is often overlooked in putting in heating plants, and consequently, when the system is not in use, water is trapped in the pipes, causing their destruction by pitting.

We have had a large experience with heating systems connected in each of the ways shown in the cuts, and with reasonable intelligence and care in the boiler room they have proved equally satisfactory.

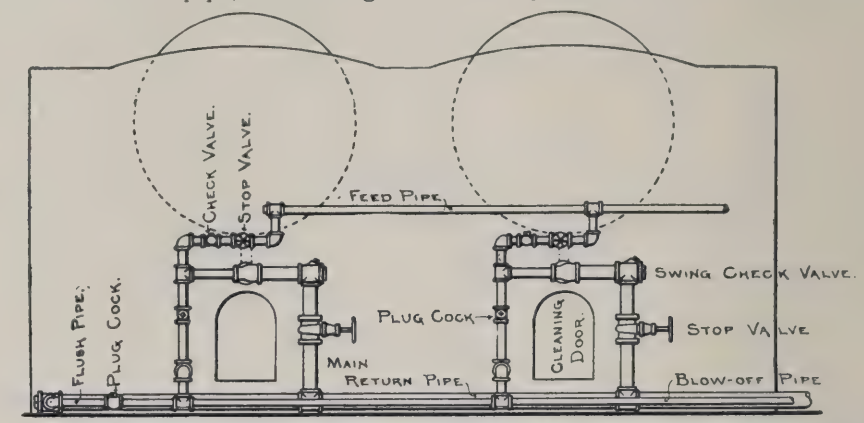


FIG. 2. ARRANGEMENT OF RETURNS WITH SEPARATE STOP AND CHECK VALVES.

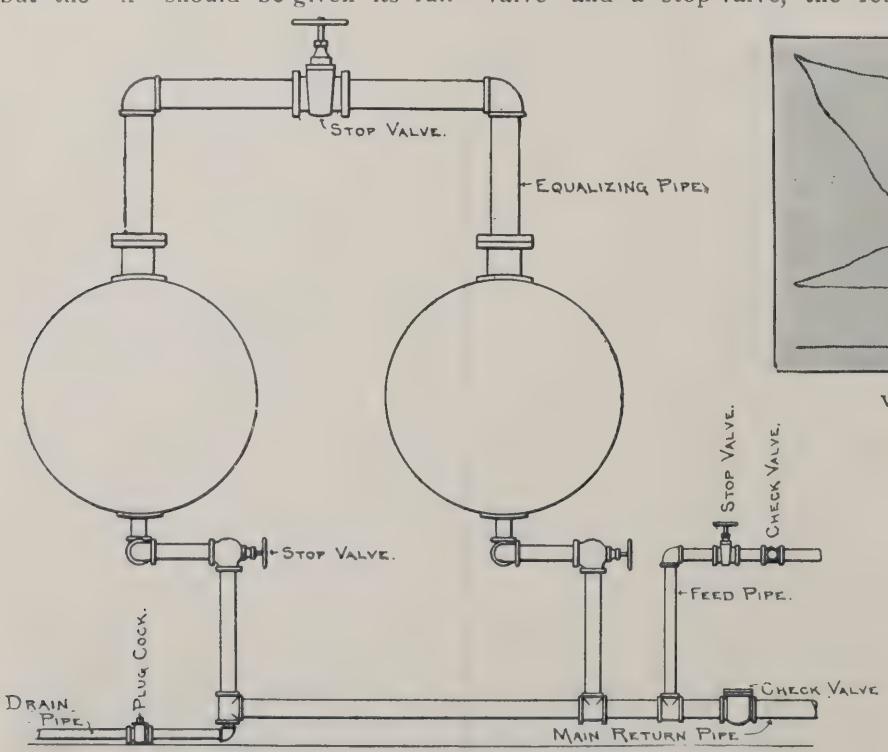


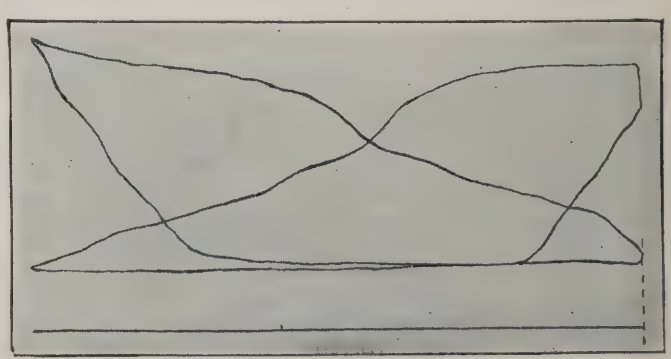
FIG. 1.—ARRANGEMENT OF RETURNS WITH EQUALIZING PIPE.

Wasteful Use of Exhaust Steam.

BY ALBERT M. SPIES, M. AM. SOC. M. E.

Economy from the use of exhaust steam from an engine for heating purposes has become so generally looked upon as a matter of course that it would seem to many almost like rank heresy to question the advisability, in any case, of utilizing so obviously valuable a waste product,—in fact to actually recommend throwing it away and substituting for it apparently more costly live steam from a boiler.

Every engineer knows that after steam has performed its legitimate function in a non-condensing engine and has there reached its limit of usefulness as a propelling agent behind the piston, it still possesses a very considerable amount of heat which can be profitably extracted in a variety of ways. For years, in fact, sermons were preached, and are still being preached, on the advantages to be derived from the several methods of turning this steam to some account until at last owners of boilers and engines became educated up to that point where they recognized that by passing the exhaust through heating systems and feed-water heaters, instead of allowing it to escape directly into the open air, they could virtually get something for nothing. However little that something might be, it represented a gain, and plans for exhaust steam heating therefore readily commended themselves as unfailing



WASTEFUL USE OF EXHAUST STEAM.

sources of profit. So long as the steam is caught in some kind of pipe system, many steam users argued, and is there made to give up some of its heat, a certain degree of saving must follow.

That in laying out such systems, however, there are qualifications to be observed which may make all the difference between gain and loss, seems to have been overlooked in many instances, and as a consequence suggestive results can be found in numbers, strikingly showing that exhaust steam may sometimes be profitably allowed to go to waste. Brief mention of one of several cases known to the writer may be of interest. The facts in the one here selected were ascertained in indicating an engine with the view of obtaining a proper basis for steam charges, a sample set of the several indicator cards which were obtained being reproduced. The back pressure observed amounted to about fifteen pounds per square inch, and was due to the fact that the exhaust steam was passed through a series of coils of two-inch pipe placed in a tank which served as a feed-water heater. It was, of course, a question of some interest to the users whether this way of heating the feed-water was a good one, or whether better results could be obtained by pumping the water into the boiler at its normal temperature, allowing the engine to exhaust freely into the open air through a larger pipe, thus bringing the back pressure down to the atmosphere, or at least near it.

Figuring up the cards showed that the total amount of steam used hourly, at the observed back pressure, was about 2,255 pounds. The total heat in the steam exhausted per hour was thus 2,684,126 heat units, and this was found to raise the temperature of the feed water in the tank through about 100 degrees. The amount of heat actually necessary to do this was obviously only $2,225 \times 100$ or 225,500 heat units, so that of the 2,684,126 units exhausted from the engine per hour, there were saved only the just-mentioned 225,500 units, or about $8\frac{1}{2}$ per cent.

If this heating of the water had been done in the boiler, it would have required probably something like $22\frac{1}{2}$ pounds of coal. With the feed-water heater not in use, and the back pressure in the engine practically at the atmosphere, the steam used in the engine per hour was only about 1,155 pounds, showing a saving of $2,255 - 1,155$, or 1,100 pounds. Assuming that the boiler was capable of evaporating 9 pounds of water per pound of coal, it becomes clear that $\frac{1100}{9} = 120$ pounds of coal were necessary to generate the surplus steam which, in passing through the heater coils, did work in heating which was equivalent to only 22.5 pounds of coal burned under the boiler. It seems almost needless to say that the heater was removed, and that its owner had learned something about exhaust steam using that was in the nature of a revelation.—Cassier's Magazine.

There are 81,000 stationary steam boilers in the German empire.

The Blower System of Heating.

It is not many years ago, says the Mechanical News, that the blower system of steam heating, the hot blast system, as it is termed by some, or heating by forced air circulation, was comparatively unknown. The first published account of such a system, applied to heating and ventilating a large store room, elicited, as we remember it, a good deal of comment and inquiry as to further details of it, and appeared to produce at once the impression that it was a system of considerable merit and one which was destined to be widely applied with most satisfactory results. Developments since then have shown very strikingly that the practical value of the system has not been overrated. At the present time, in fact, the system is in extensive use, both here and abroad, and there are hundreds of examples bearing witness to its practical efficiency.

Briefly described, the system provides for the use of a fan or blower which takes its supply of fresh air from the outside of the building to be heated, forces it over steam coils, located either centrally or divided up into a number of independent groups, and then into the several ducts or flues leading to the various rooms.

Of course there are, as may be readily imagined, numerous modifications and details of design, but the fundamental principle first outlined is the same in every case.

For reasons which will readily suggest themselves the blower system is specially advantageous in warming and ventilating large buildings where the main desideratum is the proper introduction of large volumes of air properly tempered. The difficulty in introducing such large air volumes has always been that when heat, or the natural draft in heated flues was depended upon for motive power to deliver them, an excessive amount of heating surface was necessary, as well as extraordinary large flue areas, and even then the desired result could not always be secured. At its best, a system so designed was uncertain in its performance, giving excellent results, perhaps, on one day, and proving wofully deficient on another. With the use of a blower, however, restriction of heating surface and flue area alike was at once permissible, not only without endangering in the least the proper volume of air supply, but with direct economy.

Just what degree of saving in heating surface can be effected by a forced air circulation system as compared with the amount needed in an ordinary indirect heating system has been determined by actual comparative trials.

In one set of these, which we now call to mind, a number of tin-lined flues of known area were used, each containing a different make of indirect radiator and each radiator having 60 square feet of surface. These radiators were then supplied with steam at a given pressure, and the velocity of the air current passing through each radiator and flue was determined by means of an anemometer, or, more properly speaking, an air current meter. Knowing the velocity of the air as well as the sectional area of each flue, the quantity of air passing through each flue in a given time was, of course, readily calculated. Thermometers conveniently placed in the flues gave the temperature of the warmed air, the normal temperature of the air entering each flue being also taken.

After having carefully determined the volume and temperature of the warm air passing through the flues and radiators from natural causes, a fan was applied to each flue, forcing in air, and new sets of measurements were made. The results showed that more than two and one-third as much air was warmed with the fans in use, and the falling off in the temperature of this greatly-increased air volume was only about 12.6 per cent. The condensation of steam in the radiators with the forced air circulation also was only $66\frac{2}{3}$ per cent greater that with natural air draft. Taking one of the several sets of test figures obtained, we find them to be as follows:

NATURAL DRAFT IN FLUE.

Cubic feet of air per minute	475.5
Condensation of steam per minute in ounces	11.7
Steam pressure in radiator, pounds	9
Temperature of air after leaving radiator	142°
Temperature of air before passing through radiator	61°
Amount of radiating surface in square feet	60°

FORCED AIR CIRCULATION.

Cubic feet of air per minute	1,227
Condensation of steam per minute in ounces	19.6
Steam pressure in radiator, pounds	9
Temperature of air after leaving radiator	124°
Temperature of air before passing through radiator	61°

Size of flue in both tests 12 by 18 inches.

These figures speak for themselves, and prove very conclusively that with the forced circulation of air a small amount of radiating surface will accomplish the same results as a much larger amount of surface will with natural draft. In practical applications of the fan system, of course, the proportion of radiating surface to the cubic contents of a room to be warmed will vary in different cases, just as in ordinary steam heating systems, depending as it does upon special conditions. No hard-and-fast rule can, therefore, be laid down, and the designer must rely, to some extent, upon his experience and judgment. Assuming, however, that a fan is designed to effect a complete change of air in a room once in every 15 minutes, or four times in an hour, which is a much followed practice, then a usual proportion is one square foot of radiating surface to every 300 cubic feet of room contents. This, it should be observed, is based upon the further assumption that one square foot of heating surface with the use of a fan will heat about three times as much air in a given time and through a given range of temperature, as one square foot of surface without the use of a fan. That this is about right is quite evident from the test figures above given, and from the proportions usually adopted in ordinary direct radiating systems.

Furnace Work.—III.*

James A. Harding

In the matter of hot air pipes for the partitions there is much variety of construction from which to select, whether the pipe and fittings are to be bought ready made or to be made by the furnace man in his own shop.

The limit of size in one dimension of such pipes corresponds to the width of the studs between which they are placed, and is usually four inches.

The less attenuated in cross section, or in other words the less the perimeter in proportion to the area of cross section of a pipe, the greater its efficiency: as witness the superior efficiency of a round pipe, which has the least possible perimeter (circumference) in proportion to its cross section (area) of any form made.

Any description of pipe the salient feature of which necessarily curtails the smaller dimension within four inches is inferior. A four by twelve inch pipe costs less than a 3 by 20 inch pipe having 60 inches cross section.

The 4 by 12 inch has 32 inches and the 3 by 20 inch has 46 inches girth (perimeter), and this girth represents two counter-effects to success; viz., friction and cooling surface.

A law or ordinance sometimes requires double pipes, and where such is the case the inner pipe should not be made less than 4 inches if avoidable. A better solution of the difficulty and one more in the interest of the owner as well as the furnace man is to use wider studs, or, if the partition is already set, nailon 1 by 2 inches furring where necessary to give the extra width required for pipes. This may occasionally necessitate furring the whole of one side of a room, but an inch is not much, the expense slight, and the "survival of the fittest" requires it.

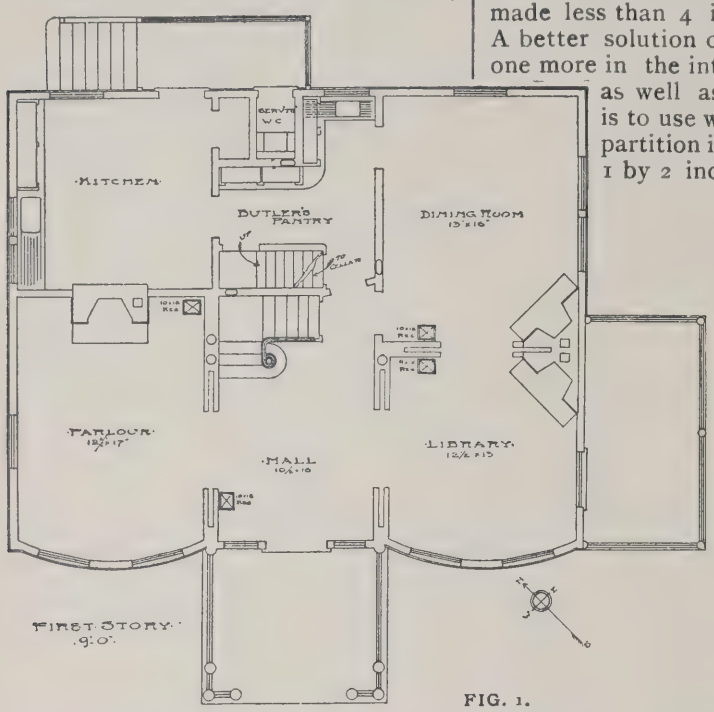


FIG. 1.

Double partition pipes are, as a precaution against fire and a matter of fact, unnecessary, and unless the laws of the furnace man's vicinage require them he can eschew them with profit. As to their safety, the least danger of fire from a furnace is where the partition pipes are. The woodwork adjacent to a partition pipe consists of studs, baseboards, wainscot, edges of flooring, and floor joists. The adjacent faces of studs, floor joists (beams), and edges of flooring should be lined with bright tin, put on with a space between the tin and wood, then the lining is the full equivalent of double pipe or better. The walls should be plastered on metal lathing down to the floor, by which means there will be ¾ to 1 inch of non-combustible material (mortar) between the pipe and baseboards or wainscot.

With double pipes the direct contact of wooden laths and other woodwork is permissible in some localities, and as through bad construction or rough handling in transit of pipes the inner is in many places in direct contact with the outer pipe, the inferiority of double pipes to single pipes properly installed is manifestly apparent to the observant furnace man, if not to his law makers.

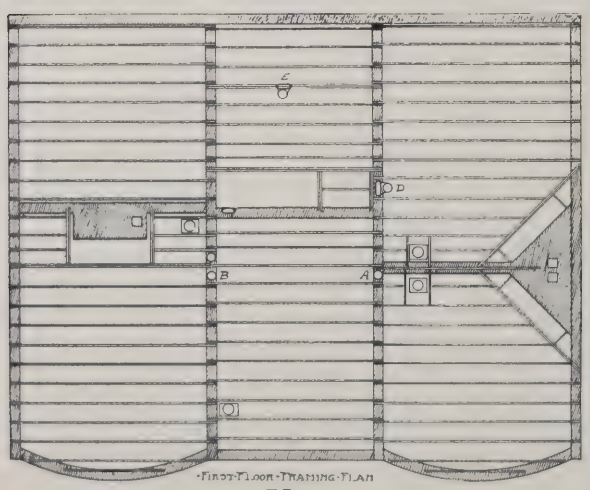


FIG. 2.

having forty-eight square inches of cross section is more effective and

Perfect safety demands an improvement upon the methods observed in the construction of the singular one-horse chaise of poetry, for the weakest part should be stronger than the rest.

The hottest part of a pipe is usually at an angle or where it changes direction; a vertical pipe is much cooler than a horizontal pipe conveying air at the same temperature. Where the connection of the lateral pipe from the furnace with the vertical pipe is between the floor joists extra precautions at this point are really necessary, while as a matter of history it is at this point where difficulties of construction are met that defective work is most frequent.

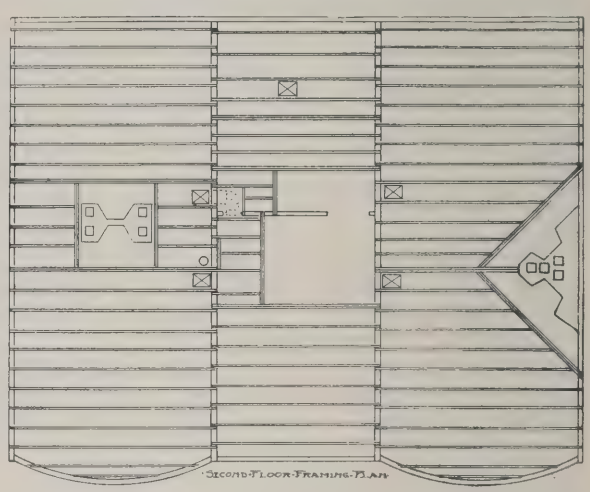


FIG. 3.

When the construction of a building is by common consent to be adapted without limit to the admission of stock sizes and shapes of pipe and fittings, the furnace man can furnish a very good ready-made job with a profitable showing; but when the rights of the carpenter are to be protected, and the architect has made no provision in his framing plans for the pipes, the ready-made fittings will to a great extent miss fire.

The best work, most successful plant, and profitable job usually result from taking measurements at the building and making the fittings to suit its construction.

The accompanying framing plans and figures show the usual method of construction employed in frame buildings and how pipes can be made and placed in a manner not to weaken the building and yet provide for adequate heating.

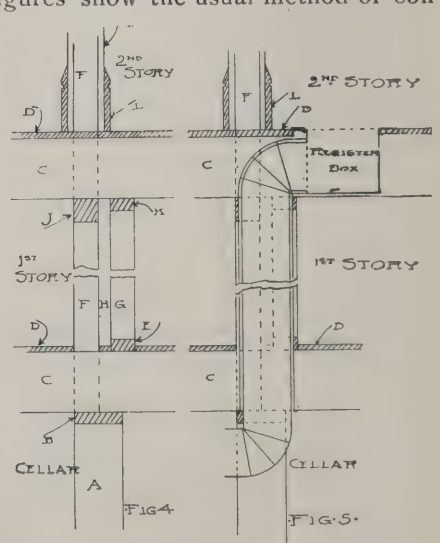


FIG. 4. FIG. 5.

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Fig. 4 is a sectional view of brick bearing wall in cellar, sliding door partition in first story, and 4—inch stud partition in second story. Fig. 5 is the same sectional view showing the installation of pipes lettered *A* and *B* on

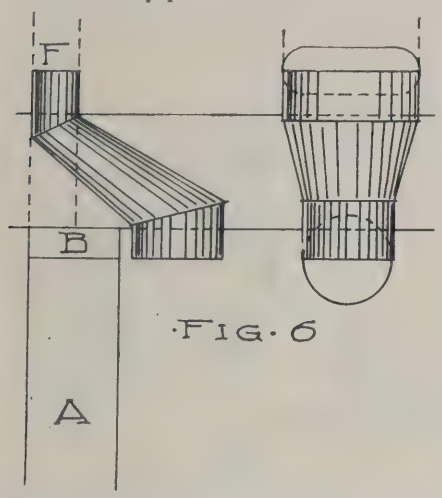


FIG. 6

framing plans, Fig. 6 showing that of pipe *D*, and Fig. 7 that of pipe *E*.

In the figures the letters indicate parts as follows; viz. *A*, 8-inch brick bearing wall in cellar; *B*, 2 by 8 inch sill; *C*, 2 by 10 inch floor joists; *D*, floor; *E*, 2 by 4 inch ground upon which partition *G* rests; *F*, 2 by 4 inch studs forming bearing partition; *G*, 2 by 4 inch studs forming half of partition necessary to provide pockets for sliding doors; *H*, pockets for sliding doors; *J*, 4 by 4 inch intertie upon which the second story partition and floor joists rest; *K*, 2 by 4 inch partition head; *L*, baseboard; *M*, plaster; *N*, double joists (Fig. 7) supporting partition.

In most small country houses the floor joists and studs are 2—inch, and are placed 16 inches apart from center to center leaving, except where floor joists lap, a clear space of 14 inches between.

Keeping this fact in view, pipes can in many cases be made of such form as to avoid cutting and framing to any extent, and at the same time equally good results can be obtained.

The office of the intertie is clearly indicated by its name, and it is in many cases unwise to cut it. It is difficult to see, however, how such a pipe as *D* can be put in without cutting the intertie, and in fact the placing of

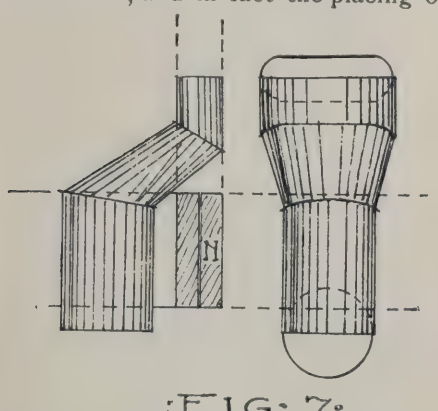


FIG. 7.

most partition pipes requires that it shall be cut. A strap of $\frac{1}{4}$ by $2\frac{1}{2}$ inch iron placed each side of the pipe to bind the intertie together until the floors are laid will provide for any longitudial strain upon it, and will be the means of softening the carpenter's heart at little expense. The floors, when laid, will bind the building together effectively.

The pipes *A* and *B* require no special work; two stock elbows and stock sizes of round pipe will fit out each.

The register boxes with which they connect may be made double, but a single box well lined will be as good and cheaper.

The pipe *D* can have cellar connection as shown in Fig. 8 at a slight saving of expense, but the connection as shown in Fig. 6 is advised for better transmission of air: and as the cellar pipe is crooked it should be favored.

The "reducer" shown in Fig. 6 can be produced by a tinsmith accustomed to making them, at a cost of less than a dollar, including material and time of laying out pattern and making.

By preserving patterns of such "reducers," and keeping a handy record of them, the furnace man will find a means of doing superior work without material increase of cost: the pattern costs more than the article.

When partitions rest upon girders in the cellar instead of brick walls the form of connection with lateral pipe

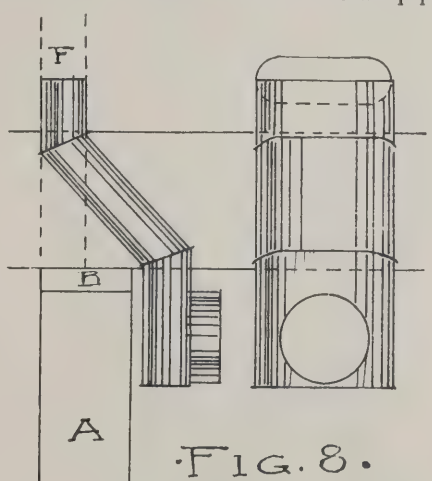


FIG. 8.

from the furnace indicated in Fig. 5 cannot of course be employed, but a form similar to those shown in Figs. 6 and 8 will be necessary. If the partition pipe is carried down to the cellar full width (Fig.8) it will in some cases be necessary to cut and frame a floor joist, whereas with the "reducer" (Fig. 6) it will merely be necessary to chamfer the floor joist from its upper edge where the pipe is wide, leaving a full bearing upon the wall or girder where the pipe is narrow: this cannot be done with ready made connections.

The double joist *N*, Fig. 7, cannot be cut, but the cupboard in butler's pantry permits the making of an offset over it above the floor.

Effects of Ventilation.

BY DR. REMONDENE.

Unimpeded ventilation accomplishes several objects. It is not alone in the necessary aeration of the blood that perfect ventilation assists us on the road to health and long life, with a better capacity for its enjoyment; but by its free and constant action, and through diffusion and dissemination of the air, it also tends to render inert and harmless those disease germs and fomitic productions that are the curse of populous centers. By ventilation we either prevent or mitigate the evils that may rise from the presence of either fomites or ochlesis. The general populace believe too literally that "sufficient for the hour is the evil thereof" to worry over the fact that disease germs have an inherent tendency to a tolerably long life, provided they are protected from light and air.

When an episode occurs like that connected with the tearing down of the fever ward in the old New York Hospital, where three of the five masons engaged died of putrid fever in a few days, or a case of diphtheria or typhoid fever occurs in a room which had similar cases a year or so previously, they are necessarily struck with the fact that the disease lurks about where it has once been, without it once occurring to them that this lurking is due to a tangible, explainable cause, a physical avoidable result, and just as plain as that when you sow barley in the ground, Providence permitting, you will surely gather a barley crop. The fact that an old mattress, a manure heap where the stools have been emptied, drinking or bathing water, the dust in the crevices in or beneath the floor or in the wall, or wall-paper, carpets, or bedding, may have retained and conveyed the infection, does not connect the fact to the popular mind that all these vehicles have carefully shielded and protected the germ from the air, or that most germs have at best but a short life if freely exposed to the air, and a remarkably short one if that air be dry, warm, and sunny.

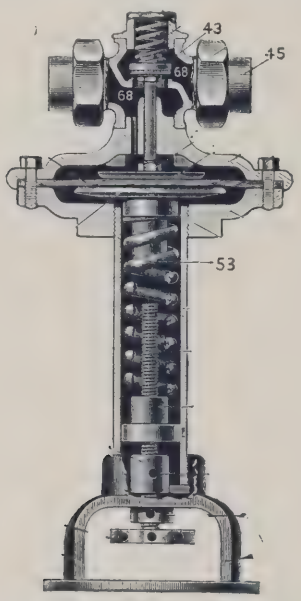
Recent experiments on the bacilli of tuberculosis have shown it to retain a wonderfully long vitality, extending for years when buried in the ground, while Koch has demonstrated that in the air and sunshine its vitality is limited to some minutes or hours. In the Crimea, the ground occupied by the French and English army became so foul that the project of reducing Sebastopol nearly came to an end without any further diplomatic or armed interference on the part of the Russians. By digging long trenches in the shape of a cross, and building fires at the intersections of the lines, the ground was drained of the mephitic gases that threatened the destruction of the troops. The shifting nomad avoids all these dangers, and, as may be easily explained, he also escapes infection from cast-off clothing, the fact of the exposure to the sun and air of the clothes having destroyed all infection being one reason, and his own better aerated blood being another.

From the above it will be seen that ventilation means more than the simple breathing of a purer air. It also means less danger from infection and disease, while deficient ventilation not only prepares the body and mind for disease and infection, but it also furnishes the viable causes for the disease and infection; hence the importance of the subject in a much greater sense than the one in which it is generally considered.— at. Popular Review.

NEW SPECIALTIES.

MASON WATER REDUCING VALVE.

The accompanying cut shows a valve designed to reduce the water pressure of the street mains to a low pressure for houses and other buildings. The body of the valve portion is fitted with couplings, as shown, so that it may be readily attached to the pipe. The regulator may be bolted to either floor or ceiling and may thus serve as a support to the pipe. The action of the regulator is as follows: the water enters through the inlet couplings 45, and passes through the chamber 68, into the low pressure side of the regulator, the valve

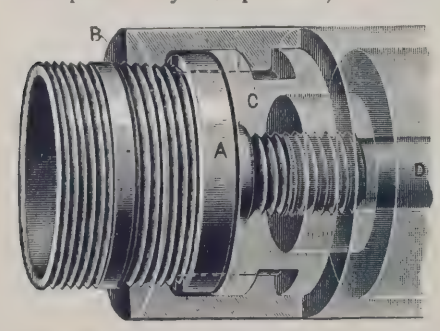


MASON VALVE.

43 being held open by the tension of the spring 53. When the low pressure has attained the desired limit, which is also felt in the diaphragm chamber through the hole which communicates with the chamber 68, it forces down the diaphragm and seats the valve. When the pressure again lowers in the system, the diaphragm is forced up by the spring and the valve again opens. The Mason Regulator Co., Boston, are the manufacturers.

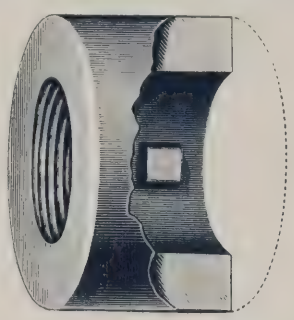
CURTIS & CURTIS NIPPLE HOLDER.

A new nipple holder has been put on the market recently by Curtis & Curtis of Bridgeport, Conn. As it is of small diameter, so that it can be used in a pipe machine, is capable of taking a large range of sizes, does not require the use of a hammer or other tool, and is comparatively inexpensive, it will no



CURTIS & CURTIS NIPPLE HOLDER.

doubt be appreciated by the trade. In operation a socket *B* (a separate view of which is given), of the proper size for the pipe to be held, is secured to the body *C* by a one-eighth turn and the screw *D* is run forward by a wheel provided at *D*. The nipple is then screwed into the socket as shown in the cut, but is so arranged that it bottoms on the plunger *A* before it jams in the thread, and is thus held secure. To release the nipple, a part of a revolution of the

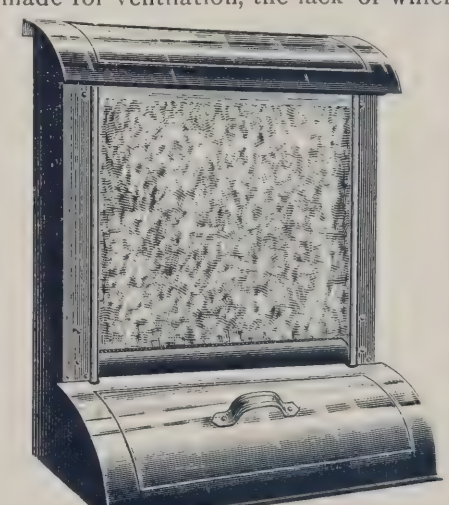


SOCKET.

screw *D* will allow it to be removed by the fingers. These holders can be used in a vise with a common die stock, with any pipe machine, or with the Forbes die stock. This firm has adapted the same principle to a holder intended for the common style of over-hung spindle machines.

COLUMBIAN GAS STOVE.

The stove shown in the accompanying cut differs materially from ordinary gas stoves in that provision is made for ventilation, the lack of which

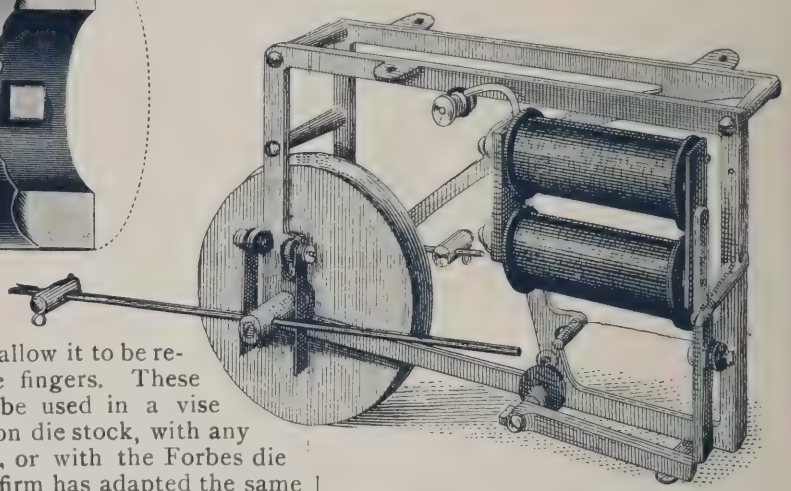


COLUMBIAN GAS STOVE.

in other gas stoves has been a decidedly objectionable feature. The front is composed of fire-proof indestructible asbestos fiber, and the heated air and products of combustion, after passing over this, pass into a hood and down around the outside of the sheet iron back, and then pass up a passage in the center to the pipe which leads to the chimney. This passing and repassing of the air over the radiating surface of the iron back allows all the heat to be given off before the products of combustion pass up the chimney. The stove is made in two sizes by W. R. Calkins & Bro., 752 E. Long street, Columbus, O.

BEERS' AUTOMATIC DRAFT REGULATOR.

This regulator is an electrical device placed in the cellar and operated and controlled by a thermostat which is placed in the living room and connected to the regulator by means of small wires. The thermostat consists essentially of a strip of steel and a similar strip of hard rubber riveted together the operation of the thermostat depending upon the difference in the expansibility of the steel and rubber. The power that operates the dampers is furnished by a weight. The thermostat is set at the degree of temperature desired, and as soon as the temperature

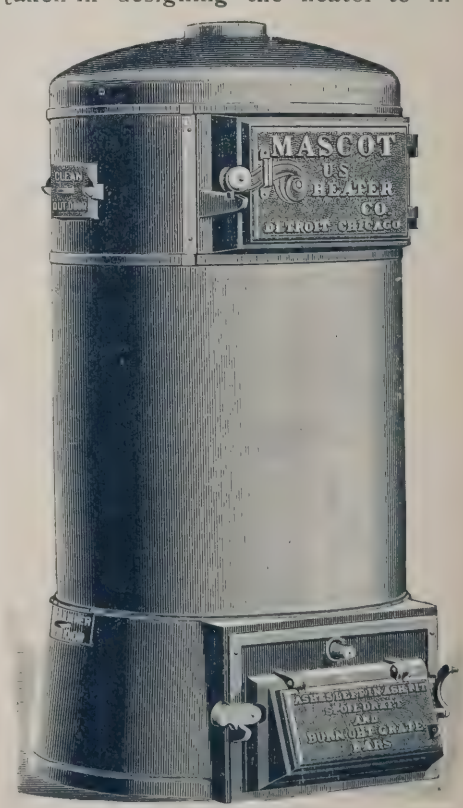


BEERS' DRAFT REGULATOR.

of the room reaches that point the regulator closes the dampers, shutting off the draft, and when the temperature falls a trifle below, it will open the dampers, allowing the fire to burn up again. Beers Bros., 506 W. Water street, are the manufacturers.

MASCOT HEATER.

This heater, shown in the accompanying cut, is specially adapted for small heating plants such as are demanded in small houses, flats, greenhouses, etc., and for furnishing a supply of hot water in the kitchens and laundries of hotels, hospitals, and other institutions, and also for barber shops, baths, etc. Special pains have been taken in designing the heater to in-

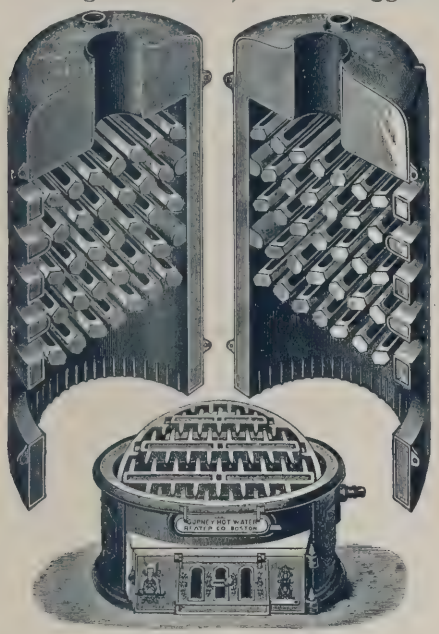


MASCOT HEATER.

sure efficient, economical action. It is made for both hot water and steam, by the United States Heater Co., Detroit, Mich.

GURNEY STEAM BOILER.

As shown by the accompanying cut this boiler is a direct surface burner, it being claimed that the fire surfaces are so effective and extensive, in proportion to the grate surface, and so staggered,

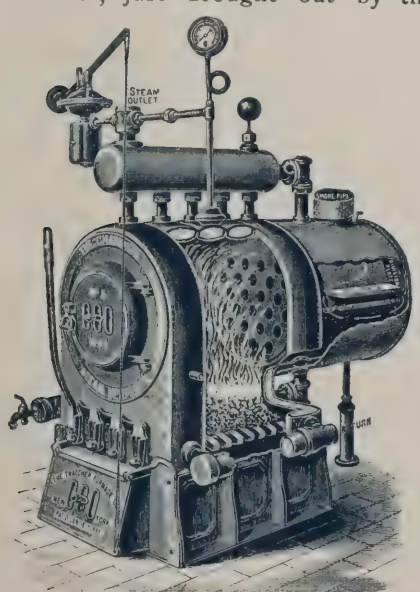


GURNEY STEAM BOILER.

that there is not left in the gases, after passing over the surfaces, more heat than there should be to operate successfully in an ordinary chimney. Provision has been made to secure a steady water line and also for removing ashes and soot, both from the ash-pit and from the fire surfaces, the approaches to both being ample. The body of the boiler is in two pieces, and there are no water or steam joints that require packing, the joints being in every instance screwed joints or iron to iron. The boiler is simple in construction, and has been thoroughly tested by a well known expert who speaks highly of its efficiency. (The Gurney Hot Water Heater Co., Boston, Mass.)

CHAMPION HEATER.

The accompanying cut illustrates a new heater, made for both steam and hot water, just brought out by the

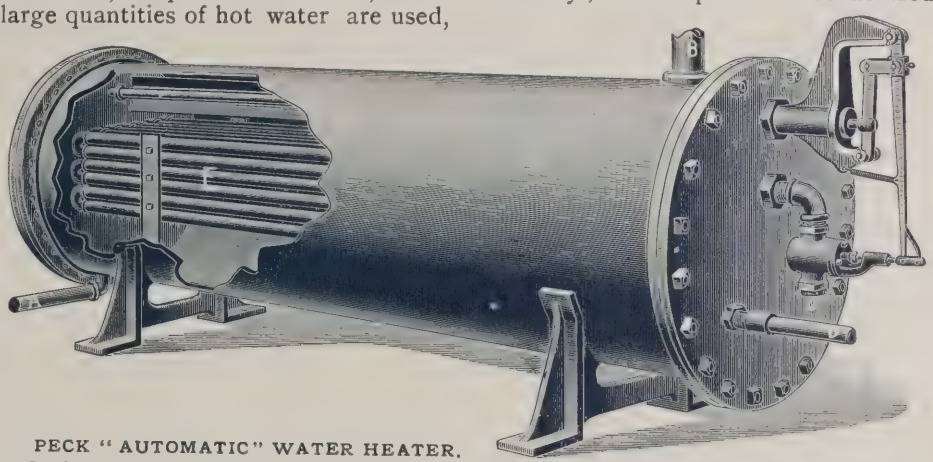


CHAMPION HEATER.

Thatcher Furnace Co., 33 Peck slip, New York. As shown, the heater consists of a combination of cast iron sections with a horizontal tubular return flue boiler. The cast iron sections are connected by nipples, with return headers at each side near the bottom and a flow header at the top of the heater, a horizontal tubular section connecting with the back cast iron section at the bottom and the flow header at the top. The back cast section is solid across the bottom, having a circular opening above, which permits a free entrance of the gases to the tubes in the horizontal section, which is inclosed in a shell in which flue plates are so arranged as to give a direct draft or effect a passage down and to the front of the division plate, thus reaching all of the surface of the boiler as the gases escape to the chimney. The grate, ash pit, and feed doors are ample in size, and all joints are outside of the heater, readily accessible in case of leaks.

PECK "AUTOMATIC" WATER HEATER.

The "Automatic" water heater is not intended for boiler feeding; it is for heating water in hotels, laundries, breweries, and public institutions, where large quantities of hot water are used,

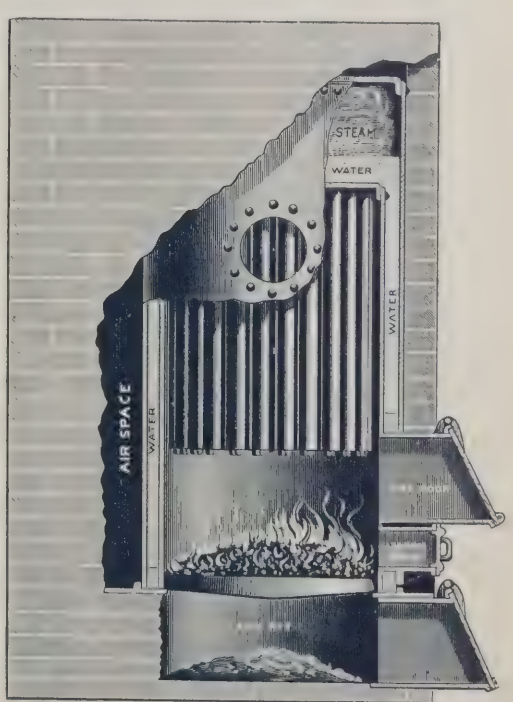


PECK "AUTOMATIC" WATER HEATER.

and where steam is available for heating purposes. The steam supply is so arranged in connection with the thermostat that when the hot water reaches the temperature at which the thermostat is set, the steam valve is automatically closed; when the temperature of the water is lowered by being drawn off, the valve is again opened, and the operation is repeated. A difference of ten or fifteen degrees in the temperature of the water is sufficient to open and close the steam supply when within the capacity of the heater. The heater consists of a shell within which is placed the steam coil, *E*; this is made of standard pipe and fittings, and is so arranged that the contraction and expansion of the pipe is fully provided for, and should the coil need repairing it can be done by any steam fitter. *A* is the cold water inlet, *B* the hot water outlet, *C* the balanced steam valve operated by the compound lever and this by the thermostat *F*, which consists of a brass tube containing a steel rod; these are fastened together at the farther end and the difference of expansion between the two metals, brass and steel, serves to open and close the steam valve. *D* is the steam return, *E* the heating coil. The heater is made by the Chase Machine Co., 111 Elm street, Cleveland, O.

REMINGTON DROP TUBE HEATER.

The house heater shown in the cut presented herewith is made throughout of best wrought iron of such thickness as to insure safety and durability. The drop tubes are screwed into the fire-box head and drop to within a few inches of the fire surface. The large amount of heating surface exposed directly to the fire insures quick steaming and the economical use of fuel. A brass tube of about one-half the diameter is fitted inside of each drop tube to insure a constant circulation of water. The usual form of grate furnished with this heater is made in three pieces, the center piece being arranged so as to drop at the outer end. The fire is conveniently manipulated with the ordinary tools through the cleaning door, which is placed under the fire door on a level with the grate surface. The cut shows the heater set in brick work, with a hot-air space around it, so that the radiating surface of the heater can be utilized to advantage to heat the hall of the house by connecting this space with a flue and running the smoke pipes to the chimney; or the space can be utilized for conducting the hot gases to the chimney, thus exposing the outer surface of the shell to the heat. The heater is also furnished with a wrought-iron casing, set on the Glenmore base,



REMINGTON DROP TUBE HEATER.

which makes a very convenient form of portable heater. The Remington Machine Co., Wilmington, Del., are the manufacturers.

Heating and Ventilation

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ELSEWHERE in this issue will be found the first of a series of articles from the pen of Geo. W. Kramer, a prominent architect, who is a member of the well-known firm of Weary & Kramer, architects, of New York and Akron, O. Mr. Kramer hardly needs any introduction to our readers, who will undoubtedly appreciate what he has to say on the subject of "Warming and Ventilation."

WHILE it is to be regretted that the dates for the annual convention of the Master Steam and Hot Water Fitters' Association conflict with those of the National Association of Master Plumbers, it should be said that if any change is made in the dates that change should be made by the latter association. The dates for the Steam Fitters' convention were arranged before those of the Plumbers, Secretary Reynolds of the Master Fitters going to considerable trouble to ascertain whether the dates of the Plumbers' association had been decided upon before announcing the dates for the Master Steam Fitters' convention. The latter will be held on June 19th, 20th, and 21st, at the Broadway Central Hotel, New York city, where Tilly Haynes, the proprietor, will be glad to make everyone comfortable. The dates of the convention were arranged so as to come at a time when all the shore resorts will be open, and the outlook for a large attendance is very good, numerous applications for rooms and space having been received.

A VERY LOW temperature in the uptake of a boiler may result either from imperfect combustion or from effective heating surface; and an unusually low temperature should excite a suspicion that there is fault in the combustion, especially when either the quantity and position of the heating surface, or both, do not commend themselves to good judgment as calculated to be notably efficient. Coal may be rapidly *consumed* even when a large portion of it is only half-burned; that is to say, when much of it is converted into carbon monoxide instead of carbon dioxide. Carbon monoxide, if passed before ignition into flues having the temperature of ordinary low pressure boilers, goes out at the uptake unburned, and all the heat it is capable of generating is then lost.

HEATING buildings from central stations has been considered by many to be unprofitable, and in this connection we should like to call the attention of our readers to the letter of Mr. I. H. Babcock, on Hot Water Heating, which appears in this issue. He presents a few facts on the subject, about which we hope to give our readers some interesting particulars in the near future.

SUCCESS in heating with hot air depends primarily upon the judgment of the furnaceman in proportioning and locating his apparatus. It is considered advisable and always economical in the end to use a size larger furnace than will just do the work, and to use two smaller furnaces where the flues may be irregular or some distance from the furnace. In city houses which are generally narrow and very deep, some furnacemen consider the use of two small furnaces as being better than the use of one, and claim that the former method gives greater satisfaction and much better results in obtaining a uniformity of temperature throughout the house.

FURNACES should be so located, according to accepted authorities on the subject of furnace work, that the hot air pipes will be of as nearly equal length as possible, making the pipes supplying air to the rooms on the colder side of the house the short ones, in case it is necessary to have the pipes of different lengths, and giving them as great a pitch or ascent as possible. It is not considered good practice to allow furnace pipes to run on a level, it being preferable to dig a pit for the furnace so as to secure a decided upward cast for the pipes, and thus insure a more rapid flow of air, heating the building more easily and with less fuel.

BENDS in hot air pipes should always be made with round elbows and curves, because air follows a curved line much more freely than an angular line. Hot air pipes are generally run directly into the upright flues, making a sharp, abrupt turn for the air. A better practice would be to make all the small, narrow, upright flues larger at the bottom with a round opening so that connection could be made by running a round elbow into the bottom, thus securing a free and easy passage of air and avoiding any possible loss of heat through its slow passage to the rooms to be heated.

SOME recent examinations of boilers used for heating residences and small buildings have led to the belief that one of the points which designers and constructors of such boilers often fail to consider properly is the supply of a sufficient combustion-chamber, by which is meant a large enough space between the ignited fuel on the grate and the flues, tubes, or passages through which the gases flow to the uptake, so as to admit of the thorough and ample admixture of air with and the complete ignition of the gases generated from the fuel before their entrance into the flues. The result is an inordinate consumption of fuel in proportion to the useful result obtained. In one instance, attention was triumphantly directed to the temperature of the smoke-pipe, upon which the naked hand could be placed and held without injury at a short distance from the boiler. This was taken as evidence that the boiler was extracting the heat so thoroughly from the products of combustion as to secure great economy of fuel, yet inquiry of the user of the boiler elicited the fact that much more coal was consumed than was necessary in a well designed boiler to produce the heat obtained. Here was a case of economy of such heat as was generated, but not economy of fuel consumed; and it is to be feared that too many similar instances of imperfect combustion, through the fact that the heating surfaces of boilers have proved efficient, have misled their designers into the belief that they were really economical,

LETTERS FROM PRACTICAL MEN.

Correspondence from practical men upon topics of interest relating to Heating, Ventilating, and kindred subjects, will find a place in this department. The editors, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

Size and Rating of Boilers.

The statement made by "Knight" in the November issue,—"It must be understood that it requires the same size of boiler to warm a given house whether you employ steam or water as a circulating medium,"—is misleading, and should not be accepted without some proof of its correctness.

In the February number "Knight" offers an explanation which is very unsatisfactory, cleverly answering a question by asking one. My reason for the statement, "One square foot of fire surface will supply twice the amount of water radiation as it will steam," is that water when in free circulation, being the best absorbent and distributor of heat, will take up and distribute more heat when in direct contact with the entire fire surface, as in a hot water boiler, than it would if one-third of the boiler was occupied by steam.

"Knight" contends that neither square feet of fire surface nor square feet of water radiation is a proper basis for computing the capacity of a boiler. While this is true to some extent, previous statements were based upon the supposition that conditions (temperature of combustion and apartments) were the same whether the boiler was used for water or steam radiation.

When speaking of water radiation, it is not generally understood that the temperature is 212 degrees, as implied by "Knight," nor do we propose to extract heat from any other source than the fire in the boiler.

What we do want to know is: Will a boiler with a given amount of fuel take up and distribute more heat units when steam radiation is attached, or when water radiation is attached? For example, a boiler with one hundred square feet of fire surface is attached to one thousand square feet of water radiation, which give off 200,000 heat units per hour under the following conditions:

Average temperature of combustion,		700°
"	" water,	170°
"	" apartments,	70°

A. C. E.

Hot Water Heating.

I have read carefully Mr. Ives' article in reply to some observations made by me in a previous number of HEATING AND VENTILATION. I do not desire to provoke controversy, but as this is an interesting field I will reply briefly to some of his points, hoping if I do not interest the public that I may succeed in enlightening Mr. Ives.

First, I confess to having confounded the two Vails, which is not very strange, since they both appear to have been working on similar lines. As I said before, I have no doubt of the efficiency of heating with hot water, single buildings or perhaps a group of buildings; but the laws of nature cannot be overcome, and it will never be as easy to move a ponderous body over long distances as a light one. Water is a solid so far as weight is concerned. Steam is a gas, and it requires no argument to prove which is the more easily transported. We all know that pumping water is expensive, and why we should use water as a vehicle of heat distribution at great expense when steam will circulate by simple boiler pressure is something that has not yet been explained. In my advocacy of exhaust steam for heating through long lines of pipe I have not "implied that back pressure on an engine does not create a retarding effect on the live steam side of the piston," but I have stated that this is overcome by an increase of initial pressure at the boilers, which as every man of experience knows entails but a trifling additional expense in fuel. Station managers say they can perceive no difference.

Mr. Ives condescends to inform us that "conditions might exist under which exhaust steam could be economically used to do a limited amount of heating," which shows that Mr. Ives' fund of knowledge and observation is extremely limited. If he will not take it amiss, I desire to enlighten him by citing the experience of several electric companies in their every-day operations. The Ottumwa (Iowa) Electric Railway Company is supplying exhaust steam through more than three miles of underground pipe, successfully and economically. It is admitted that it is the best-paying part of their plant. The Cedar Rapids (Iowa) Electric Light & Power Company runs three-fourths of a mile of exhaust steam mains in two directions from its central station, and is heating many buildings at a profit, it is said, of more than 15 per cent upon the amount invested. This will be increased as the business grows. The Springfield (Ill.) Electric Light & Power Company is using the exhaust from its electric light engines and also from an electric railway plant. The income from the sale of exhaust steam for commercial heating was $12,000 the past year, ten thousand of which was net on an investment of less than $25,000, or about 40 per cent per annum. These facts can be verified from the companies themselves if any one wishes to do so. Many other concerns are realizing similar results.

Mr. Ives cites the New York Steam Company as not having been a dividend-paying concern. What of that? The New York Company is making money, and its profits go into extensions, which would not be the case if the business was unprofitable. The New York Company suffered at first from too much expert engineering. Since the mistakes were corrected it is prospering. And it is not the only concern that has suffered from too much C. E. Theory is well, but practice combined with it is better. One of the early mistakes of that company was a return pipe, which is not a feature of the Holly system. This return is not necessary in order to economize heat. The Holly system of house heating is a combination of direct and indirect heating. The water of condensation is taken to cooling coils in the basement, the heat escaping through a register in the floor above; the water then escapes to the sewer, cold. One of the evils of return pipes, as shown in the New York, and in the Boston hot water plant, and probably will be in the Evans system, is that the return water corrodes and destroys the pipes in a very short time.

In conclusion I will say that there is no class of corporations in this country to-day that for the time they have been in existence are paying the investors as well as the steam heating and power companies.

I. H. BABCOCK.

NEWS AND NOTES.

Large Buildings.

Morristown, N. J.—Architect George W. Bower is making plans for a handsome dwelling for Edward W. Howell.

Erie, Pa.—Architect J. W. Yard is making plans for a $35,000 dwelling for Hon. W. C. Culbertson of Girard, Pa.

Providence, R. I.—A brick block is to be built between Beverly and Aborn streets for Fred Talcott of the Rhode Island Label Works, from plans of Stone, Carpenter & Wilson, to be four and three stories high. J. W. Bishop & Co. will be the builders.

Boston, Mass.—Cram, Wentworth & Goodhue of 53 State street have made plans for the handsome dwelling to be built for Frank Twining of G. P. Ide & Co. of Troy. N. Y., to be located in Lansingburgh. Plans for a Masonic hall to be erected at Center and Seaverns, in Jamaica Plain, Mass., have been completed by Levi Newcomb of Exchange Place, to include stores, hall and dwelling and to cost $20,000.

Philadelphia, Pa.—W. A. Patterson of 3424 Vine street will build four stores and dwellings on 56th street near Vine.

Newark, N. J.—Henry N. Doremus will erect a four-story business building on site of 447 Broad street. He will do the carpenter work. Thos. Cressey is architect.

Albany, N. Y.—The Assembly has passed Mr. Baker's bill, appropriating $33,466 for new boiler house, guard post, and isolation cell at Clinton Prison.

Worcester, Mass.—In the early spring it is the intention of Mr. C. C. Houghton to erect a business block on east corner of Front and Church streets, to be probably of brick and five stories high. No contracts have yet been awarded.

Paterson, N. J.—John W. Ferguson has been awarded the contract for the proposed State armory at $127,450.

Philadelphia, Pa.—Architect Charles Balderston has submitted plans to the Building Inspectors for a ten-story storage warehouse to be built on Market street near Eighteenth, for the Fidelity Warehouse and Storage Co.

Detroit, Mich.—Jacob T. Farrand of 34 Woodward avenue will spend $15,000 in remodeling the building on East Larned street from plans of Donaldson & Meier of 88 Moffatt Building.

Duluth, Minn.—The Board of Trade will at once rebuild their recently burned building.

Washington, D. C.—The Supervising Architect of the Treasury calls for bids to March 1st for all labor and materials for the proposed low-pressure return-circulating steam heating and ventilating apparatus for the United States post-office building at Cedar Rapids, Iowa. It is expected that bids will be called about May 1st for the proposed new court house at Saginaw, Mich.

Brooklyn, N. Y.—Fred Figge of 178 Schermerhorn street will build two brick flats at Nos. 301 and 303 State street to cost $25,000.

Corning, N. Y.—The brick block at Pine and Market streets is to be torn down and replaced by a $30,000 brick block to be built by James A. Drake.

Marquette, Mich.—Chas S. Morley of 68 West Alexandria avenue will build a $75,000 sanitarium from plans of E. Myers of 3 Moffatt Building, contracts not yet let.

Washington, D. C.—W. Kimmell has taken out a building permit for three dwellings at 1715 to 1719 De Sales street to cost $21,000.

Tewksbury, Mass.—The contract of Hardy & Cole for the State Buildings at Tewksbury will amount to $30,000. L. E. Locke, who has the whole contract, will begin work April 1.

Burlington, Vt.—M. W. Adams will build a three-story brick block to be occupied as stores and hall on Bank street.

New York.—Buchman & Deisler have plans under way for large additions and improvements to the buildings of Ehrichs Brothers, at 23rd street and Sixth avenue.

Brooklyn, N. Y.—A large public building will be erected at Willoughby avenue and Broadway, as per plans now on view in drug store at Kosciusko avenue and Broadway. The building is intended to replace the recently burned Warner Institute.

La Peer, Mich.—A $50,000 Asylum for the Feebleminded will be built at La Peer, from plans of Julius Hess, 44 Buhl Block, Detroit, Mich. Cyrus G. Luce is president of the Board, Gilead, Mich.

Winona, Minn.—The Philharmonic Society will receive bids to March 31 for placing a steam-heating apparatus in their new structure. Bids will be received by Joseph Leicht and must state size and style of boilers, if horizontal tubular not more than two, and not in excess of 50 inches in diameter by 9 feet, also size of pipes, radiators and fitting and present figures for fan systems. Address J. Scherffius, Winona, Minn.

Pittsburgh, Pa.—Bids are being received at the office of Architect Charles Bickel, for a nine-story building to be erected during the coming summer for the L. H. Smith Wooden Ware Co., at Seventh avenue and Cherry Alley. Work to be begun about May 1.

Dover, N. H.—Theo. W. Woodman will begin the work of erecting the new block at the corner of Hale street and Central avenue in the spring.

Elizabeth, N. J.—The New York Life Insurance Co., which owns lot and buildings on Broad street, proposes to tear these down and build offices and stores there.

Boston, Mass.—The contract to build the new Music Hall in Boston has been awarded to L. P. Soule & Co. of Cambridge.

Boston, Mass.—Hazen Clement of Clement, Parker & Co. will build a brick and stone building to be occupied as dwelling on Commonwealth avenue.

New York.—The Building Committee of the new New York Clearing House have invited seven prominent architects to submit plans for competition, to be in by April 1st.

Winchester, Mass.—Edward Ginn, the book-publisher, is having plans made for his proposed $50,000 dwelling on site of his present residence in Winchester.

New York.—A. B. Ogden & Sons have taken out building permit for a five-story brick flat to be built at Madison avenue and 94th street for John H. Gray of 2 East 94th street to cost $42,000.

Detroit, Mich.—Rogers & McFarlane of 73 Moffatt Building are architects for the five-story $20,000 building to be erected at Sixth and Congress streets.

New York.—Architect Montrose W. Morris has taken out building permit for a four-story brick dwelling, to cost $100,000, to be built for Abby S. Thompson of the Murray Hill Hotel, and to be located at 297 Madison avenue.

London, Ont.—The Y. M. C. A. will erect a $75,000 edifice.

New York, N. Y.—The contract for the new Armory for Troop A to be located at Madison avenue and Ninety-fourth street, has been awarded to John F. Johnson at $131,679.

Washington, D. C.—The Committee on Ventilation and Acoustics of the House of Representatives are taking steps to improve the ventilation.

Rochester, N. Y.—The bid of Adam Friedrich & Sons for the proposed new Court House for Monroe county has been accepted at $295,343.

New York.—Sealed proposals will be received to 17 March at the office of John Ireland, 265 Broadway, for labor and materials for the New York State Reformatory for Women at Bedford in Westchester county, to include main building, dormitory, prison, four cottages, laundry, and boiler house, as per plans at office of said Ireland or at office of Wilson, Adams & Co., 149th street and Harlem River, or at the residence of Samuel William Johnson, Mamaroneck, N. Y.

Pontiac, Ill., County Board has voted $40,000 for new building for Livingston county.

Detroit, Mich.—Rogers & McFarland are making plans for a ten-story business building to be built for Leonard & Castner, the furniture dealers, on Gratiot avenue.

Hartford, Conn.—The Hartford Courant is authority for the statement that there is grave complaint with regard to the ventilating of the County Building.

Buffalo, N. Y.—The directors of the Real Estate Exchange have decided to go ahead with their proposed building, and it is likely that ground will be broken about May 1st. Green & Wicks of Buffalo are architects.

Philadelphia.—Contractor Henry Taylor has taken out a building permit for a five-story brick apartment house at 112 Norrh 18th street.

Brooklyn, N. Y.—P. Sheridan of Willoughby and Marcy avenues has taken out building permit for two brick flats to be built at Nostrand avenue near Myrtle and to cost $22,000.

Hartford, Conn.—A. N. Belding of Belding Brothers & Co., the silk merchants, has had plans made for a handsome dwelling to be built for himself on Talcott avenue.

Pittsburgh, Pa.—Black & Baird are having plans made for a nine-story warehouse to be built on Penn avenue, near Tenth street. The South Side Hospital Association has taken out building permit for their proposed $43,000 building.

Philadelphia, Pa.—Architect Watson has made plans for a handsome colonial dwelling to be built for George Rugan Neff on Welsh Road east of Bustleton Pike, and for an apartment house to be built for J. Scharf on Monroe street between Third and Fourth streets.

Trenton, N. J.—Howell Brothers will build a row of houses on Monroe street in the spring.

Philadelphia, Pa.—Architect Addison Hutton has plans on the boards for extensive additions to be made to the Wood Building at 400 Chestnut street. Architects Boyd & Boyd are making plans for a handsome dwelling for Governor Pattison, to be built at Overbrook, with all modern improvements.

Washington, D. C.—A hospital is to be built in connection with the Lucy Webb Hayes Home, to be called The Dorothea Lowndes Sibley Memorial Hospital.

New York, N. Y.—Jas. W. Cole of 403 West 51st street, is architect for the five-story brick flat to be built for Samuel Mehrbach of 74 East 54th street on 94th street near Third avenue to cost $22,000. Building permit has been taken out. Andrew Spence of 163 East 125th street has taken out building permit for two four-story dwellings to be built for E. Bruno Thiele of 319 East 125th street on 119th street near Lenox avenue, to cost $52,000.

Boston, Mass —Winslow & Wetherell of 3 Hamilton place are architects for the large business block to be built on Harrison avenue and Essex street for John H. Pray Sons & Co., to be 75 by 130 feet and five stories high.

New York, N. Y.—The plans of E. A. Sargent and W. A. Cable have been accepted by the Armory Board and when approved by the Sinking Fund Commission will be let on contract by the Board.

Yonkers, N. Y.—The Police Commissioners have asked the council to approve of their bill for a $30,000 headquarters.

Hartford, Conn —The contract for building the new insane asylum at Middletown has been awarded to H. B. Philbrick at $75,000.

Brooklyn, N. Y.—Thomas Farrell of 536 Carlton avenue will build two brick flats on Bergen street near Carlton avenue, to cost.

Athens, Ga.—Michael Brothers have let the contract for their proposed five-story business building to Watson Brothers, to cost about $30,000 and to be fitted with hydraulic elevator, plate glass, and all modern improvements.

Detroit, Mich.—Wilson Brothers & Co. of Philadelphia, Pa., are architects for the proposed business building, to be erected by the Barnes estate, represented by Gray & Gray of 34 Moffatt Building, Detroit, Mich., to cost $75,000, to have all modern improvements.

Detroit, Mich.—Wm. J. Joy of 50 Hodges Building is architect for the business building, to cost $75,000, to be built for Robert J. Wilson of the Hammond Building.

Princeton, N. J.—Plans are under consideration by the faculty of the University for a $50,000 dormitory for freshmen.

Providence, R. I.—Builders N. B. Horton & Wilmarth & McKillo will soon begin work on the business block for Jas. Haney, from plans of Wm. R. Walker & Sons, at Washington and Union streets, to be five stories high.

Morgantown, W. Va.—The Odd Fellows Lodge will soon begin work on their proposed $20,000 lodge room, office building, and theater.

Boston, Mass.—Architects Fehmer & Page are now working on plans for the proposed Worthington Building, to be located at State and Congress streets, to be ten stories high.

Philadelphia, Pa.—Trustee Chas. C. Harrison of the building fund for the proposed new club house for the students of the University of Pennsylvania states that work will soon be begun, as they have $50,000 on hand.

Adrian, Mich —Pierce & Bickford of Elmira, N. Y., are the architects for the $20,000 gymnasium to be built for Adrian College of which D. C. Thomas is president, to have all modern improvements.

Mills and Factories.

Richmond, Va.—Talbott & Sons have been awarded the contract for the new purifying plant at $26,847.74.

Springfield, Mass.—The Boston & Albany Railroad have decided to remove their car shops from Springfield to West Springfield, where they will erect two buildings, each 90 by 400 feet.

Elam, Pa.—The National Kaolin Co. proposes putting in a plant for the manufacture of pavement brick to cost $85,000.

North Tonawanda, N. Y.—O. T. Stoteman of Milwaukee, Wis., is in town seeking a site. He is a manufacturer of vapor and liquid fuel burners, also boilers for steam and hot water apparatus, and employs a large number of men.

Columbus, O.—Plans and specifications are being prepared by Kremer & Hart for the erection of a 30 by 60 building, to be three stories high, to be used as bottling house for C. Born & Co.

Portsmouth, Va.—Portsmouth Cotton Manufacturing Co. will build a two-story brick building from plans of H. S. Chadwick of Charlotte, Va. Grimes, Overman and Burroughs of Portsmouth, Va., have the building contract. They want estimates on automatic sprinklers and hot air heating.

Troy, N. Y.—Andrew Ruff has decided upon the erection of a new mill on his property on Spring avenue, to be three stories high and 90 by 40. Architect B. J. Noack has drawn plans.

Pawtucket, R. I.—The American Machine Co. has selected site for an enormous plant to employ 1,500 hands.

Philadelphia, Pa.—John Hohenadel of 35th street and Queen Lane has taken out building permit for a three-story brick and stone cold-storage warehouse to be located there.

Wallingford, Conn.—The H. E. Biggins Silver Co. have let contract to W. E. Becroft for their proposed two and a half story building for silver-plating and britannia metal, from plans of C. F. Wooding of Wallingsford, to be built at once; and they now want estimates on automatic sprinklers, one 75 horse-power boiler, and one 50 horse-power engine.

Philadelphia, Pa.—Steps are being taken by J. D. Kilbournm, consulting engineer in the Drexel building, for the erection of a large ice-making plant for the Jefferson Ice Manufacturing Co. to be located at American and Cumberland streets. The company is capitalized at $200,000 and H. F. Millick is president.

Quincy, Ill.—Plans and specifications are now being prepared for a four-story building for the Excelsior Show Case Co. to replace the factory recently burned, cost $50,000. Joseph Knittol is owner.

Alexandria, Ind.—The Shackleton Steam Radiator Co. have closed a contract with Alexandria capitalists and a large factory will be built.

Dansville, N. Y.—The Board of Trustees of the Danville Gaslight Co. have been granted a franchise to lay pipes in the streets for furnishing fuel gas for heating purposes.

Pittsburgh, Pa.—A building will be re-erected by J. J. Van Degrift at Penn avenue and Third street, to be used as power house for a large number of industries.

Worcester, Mass.—Fuller & Delano are making plans for the new building for Prentice Brothers, machinists, to be located on Taintor street.

Savannah, Ga.—The Florida Central & Peninsular Railroad will soon begin the erection of repair shops here.

Whitestone Landing, N. Y.—The New York Shipbuilding & Engine Co. will locate a large plant here.

Boyertown, Pa.—The Union Manufacturing Co. want estimates on belting, boilers, elevators, a 75 horse-power engine and pumps. John Sabot is architect and contractor for their proposed brick building, to be completed in about three months.

Philadelphia, Pa.—Architect Frank R. Watson is making plans for a five-story brick addition to the candy factory of the Keystone Candy Co. at Susquehanna and Germantown avenues.

Jeannette, Pa.—Plans have been prepared and work will soon begin on the proposed additions to the Jeannette table and general flint glassware factory of McKee Brothers, to be the largest and most complete plant in America.

Ansonia, Conn.—It is officially stated that the Williams Typewriter Co. will build a factory at Darby. The Housatonic Water Company will build for them a large factory.

Shawano, Wis.—Architect Pride of Appleton, Wis., will make plans for the proposed new mill at Shawano for the Wolf River Paper and Sulphur Co.

Manchester, N. H.—J. S. Matthews is forming a $20,000 stock company, and they will erect a building on Page street for the manufacture of boots and shoes. Samuel T. Page, Jos. Rand, and Mead & Mason are interested in the venture.

Kingston, N. Y.—As soon as weather permits, the Hudson River Furniture Co. will build a handsome four-story brick building, with elevators, electric lights, and all modern improvements.

Lynn, Mass.—John B. Benton is having plans made for a four-story brick building, to be 125 by 40 feet, two stories high, to be located on Boston street.

Bridgeport, Conn.—Gottleib Krueger of the Krueger Brewing Co. of Newark, N. J., proposes to locate a mammoth brewery in Bridgeport. Andrew Radel of the Traction Co. represents him in Bridgeport.

Union Hill, N. J.—The Daniel Bermes Brewing Co. contemplates erecting a $20,000 boiler house to face the Boulevard, and they also contemplate erecting an office building at Columbia street and the Boulevard.

Haledon, N. J.—The owners of the Atlas Silk Mill propose to make an addition to their plant.

Manchester, N. H.—The Home Building Association will build a large building for wood-working purposes in East Manchester.

New York.—Peter Doelger of 407 East 55th street has taken out a building permit for a six-story brick brewery to be built at 413 to 419 East 55th street as per plans of Architect J. Kastner.

Cohoes, N. Y.—The contracts for building for the Continental Knitting Co. are now being figured on by contractors. The officers of the company are J. H. Wilson, president, John A. Bennett, secretary, and W. B. Clark, treasurer.

Beaver Falls, Pa.—A large paper mill is being built by the Hartman Wire Mat & Fence Co. for parties whose names they will not make public.

Louisville Ky.—The Hall & Maynard Company will build a cracker factory at Floyd and G streets, to be of stone and brick, to cover five acres, to cost $50,000, and to be completed July 1st.

Jamestown. N. Y.—J. Bastien of Rochester states that a plant will surely be established here by a company with a capital of $100,000. Architect George Metzger of Buffalo will make plans.

Scranton, Pa.—Wm. Edwards of Philadelphia and his superintendent, Benjamin Davis, are making preliminary arrangements for the construction of an immense plant to be the counterpart of their property in Philadelphia, the Edwards tin-plate works.

Schools and Colleges.

Amityville, N. Y.—The contract to build the new public school has been awarded to Winfield S. Velsor of Islip, at $19,300.

McKeesport, Pa.—Sealed proposals will be received to March 15 for a system of hot-air heating and ventilating and sanitary dry closets for the proposed 16-room public school building in the Seventh Ward, as per plans in office of H. J. Lohman, architect, National Bank of McKeesport Building.

Fond Du Lac, Wis.—School board is considering the erection of a $20,000 school building.

Scranton, Pa.—A new school, No. 27, will be built this summer on the Green Ridge side of the North End.

Altoona, Pa.—The plans of Robinson & Snyder of Altoona, Pa., have been accepted for the new high school, to cost $30,000, to be located on Seventh avenue.

Georgetown, D. C.—There is a movement on foot to erect a $70,000 high school building. Address E. P. Berry, S. T. Brown, or J. H. Wilson.

Washington, D. C.—There is a movement on foot to erect a new school house in Mt. Pleasant District. Address Gen. R. Spear, Chapin Brown, or N. E. Young for details.

Philadelphia, Pa.—J. E. and A. L. Pennock have been awarded the contract for building the proposed new Swedenborgian school in Moreland Township to cost $1,000,000.

Bristol, Pa.—It has been decided to build a three-story brick school to cost $50,000.

West Hoboken, N. J.—The Board of Education has accepted the plans of Kreitler & Herbert of New York for proposed school in the southern part of the city.

Wenonah, N. J.—The plans of Architect C. R. Peddle of Woodbury, N. J., have been accepted for the proposed new school for Wenonah, to be of Trenton brownstone, with grey-stone trimmings.

Bethel, Conn.—Builder Sunderland of Danbury is mailing plans for two proposed new schools for Bethel, and plans and estimates will be submitted to town meeting soon to be held.

Mercersburg, Pa.—An addition 60 by 100 will be built to the school during the coming summer.

Fitchburg, Mass.—Sealed proposals will be received at the office of the City Clerk to March 24 for construction and completion of the new High School building on Academy street as per plans of Architect Francis, in the office of the Superintendent of Public Buildings; Samuel Anderson, chairman Committee on City Property.

Scranton, Pa.—The Board of School Control, through Mr. Thompson of the Building Committee, has reported in favor of appropriating $30,000 for the erection of a new school at the corner of Boulevard and Columbia avenue on the John T. Porter property, that the heating and ventilating of the new building be competed for, and that mechanical ventilation be used.

Lawrence, Mass.—Architect W. P. Regan has presented plans for the enlargement of the High School to cost $26,000.

Black Rock, N. Y.—Buffalo architects have been invited to submit competitive plans for the proposed sixteen-room school to be built on the Guernsey street lot, to cost $60,000.

Le Mars, Iowa.—The trustees of St. Joseph's Catholic church have decided to erect a $20,000 parochial school. Rev. H. J. Meis is pastor. Burkhead & Reese have made plans.

New York —The new school house to be erected for Grammar School No. 9 will be 145 by 93 feet, and cost $173,000.

Elyria, O.—Board of Education is advertising for bids for a $40,000 high school.

Detroit, Mich.—The Board of Education, of which Daniel Wallace is secretary, will build a $35,000 school at Military avenue and Regulas street from plans of Malcomson & Higginbotham of 53 Moffatt Building.

Milford, Mass.—Board of Education are discussing the matter of erecting a $40,000 school house here.

Waycross, Ga.—A $20,000 school house will be erected this year.

New Haven, Conn.—Plans are being considered for the new Normal school to be erected in New Haven. A. B. Morrill, principal. Cost $100,000.

New York, N. Y.—J. C. Cady & Co. of 131 East Seventeenth street have made plans for the proposed $150,000 building for the Yale law school at New Haven, Conn

Manchester, Conn —The plans of Curtis & Johnson of Hartford have been adopted for the proposed new school for the Eighth school district, and estimates are now being taken.

Somerville, Mass.—The contract for the building of the Kent street school house has been awarded to T. F. Farrington at $12,190.

Baltimore, Md.—A five story wing is to be added to St Mary's Seminary at St. Mary and Paca streets, to cost $35,000.

Paterson, N. J.—The committee on buildings, fuel, and janitors of the school board are looking over plans for the proposed school to be built on Nair street

Churches.

Bernville, Pa.—There is a movement on foot to erect a new Lutheran church.

Waterbury, Conn —Architect Jos. A. Jackson has completed plans for the Lutheran Catholic church to be erected on South William street.

Baltimore, Md.—The Calverton Mission of Lafayette Square Presbyterian church will erect a new edifice. Thos. Joplin, pastor.

Philadelphia, Pa.— Ground will soon be broken at 42nd and Parish streets, for the new edifice to be erected by the St Peter's German Lutheran church. Cost $30,000. Rev. E. Herman Pohle, pastor.

Atlantic Highlands, N. J.—Plans have been completed for the $20,000 brick structure to be erected by M. E. church on Third avenue.

Ithaca, N. Y.—The Catholics will erect a new edifice in the near future.

Binghamton, N. Y.—The contract for erecting the new Lutheran church of the Redeemer has been let to Edward Tillson of Lestershire. T. I. Lacey & Sons made plans.

Ridgefield, N. J.—A new Methodist church will soon be built. Rev. J. B. Faulks, presiding elder.

Bensonhurst-by-the-Sea, N. Y.—The Episcopalians who have been worshipping in Bensonhurst Hall on Eighty-sixth street, with Rev. Henry M. Kirby as pastor, have decided to erect a church at Thirty-sixth street and 23d avenue.

Montreal, Canada.—The Church of the Messiah proposes to build a new edifice.

Brooklyn, N. Y.—The First Baptist Congregation, now worshipping in the Academy of Music, will erect a handsome edifice opposite the site of the old tabernacle.

Beverly, N. Y.—New heating apparatus is to be put in the Baptist church.

BUSINESS NOTES.

The School Board at Dent, Ohio, have grown tired of stoves, and have just closed contract with The Bennett & Peck Heating & Ventilating Company for their system in their school building.

Chas. G. Campbell will represent Raymond & Campbell of Middletown, Pa., as general agent for the steam and hot water department during 1894. He says if you see it about the "Sun" it's so, that is, that they are doing big work.

The Standard Radiator Co. of Buffalo have the contract for the radiation of the Asylum for the Blind, Pittsburgh. James Orth, architect, Pittsburgh Supply Co., contractors, 12,000 feet of radiation. They have also secured the contract for the Central Union Life Building, Buffalo, N. Y.

John B. Hughes and H. W. Stone have entered into partnership under the firm name of Hughes & Stone, with offices at 106 No. Tenth street, St. Louis, Mo They will do a general contracting business, installing steam and hot water apparatus, also steam pipe work in all its branches. All work intrusted to them will be promptly and faithfully executed.

The J. F. Pease Furnace Co. of Syracuse, N Y., have made Rand & Conderman, of 822 Girard avenue, cor. 9th street, Philadelphia, their exclusive agents for Philadelphia, Camden, and suburbs. The Pease Co. are heating the house of Fredk. Shaw, of J. E. Caldwell & Co., jewelers, Telpohoken, Germantown, receiving the contract although highest bidders by $100. They have sold a plant to W. G. Doherty, of Bromley carpet mills, whose residence is at Oakham, Philadelphia.

The New York Central and Hudson River Railway Co., besides being the owners of the only trunk line with a depot in New York City, is most popular from the fact that it is always trying to accommodate the public. This has been especially true since Geo. H. Daniels has dictated the policy of the passenger department, as he has studied carefully the wants of all of its patrons. To-day if you wish to go on a journey you have a choice of 14 splendid trains North and West bound, 12 splendid trains East and South bound, besides the privilege of riding on the fastest train in the world, the Empire State Express, without extra charge. Four tracks give absolute safety, and the road reaches directly the principal cities in the state. Stop over privileges are allowed on all regular tickets.

Hart & Crouse of Utica, N. Y., are pushing things as usual. We are just in receipt of their new hot water catalogue which is bound in a very rich cover of antique style. The frontispiece if a beoutiful picture showing the triumph of a love, that is, the "Royal" is being crowned king by its loving friends. The advantages of hot water heating follow. This treatise is written by Mr. W.M. Mackay, the company's New York manager, whose reputation is second to none in the country. Beautiful cuts follow, showing thoroughly the construction; then the price list and capacities are given and directions for setting up and using. A few selected testimonials are also given. These catalogues are free to every one for the asking.

Smith & Winchester of 19 to 37 Wendell street, Boston, Mass., have just issued their second illustrated catalogue of steam, water, gas, and plumbing supplies, wind engines, pumps, artesian well material, tools, etc. It is the handsomest and most complete catalogue of its kind, we venture to say, ever issued in the New England States, and will prove of great service and convenience to those of the firm's patrons who are fortunate enough to secure a copy. It is a handsome quarto volume of nearly 800 pages, well printed on excellent paper, and substantially bound in blue and gold. Most of the articles enumerated are illustrated by means of well executed wood engravings; so that, aside from its value as a catalogue and price list, the volume serves as a cyclopedia of the several lines of goods mentioned. The preparation and publication of such a work is a very expensive undertaking, and Messrs. Smith & Winchester deserve the thanks of the trade for their enterprise in this direction.

The Gurney Hot Water Heater Co., notwithstanding the alleged hard times, makes its spring bow to the public, and to the steam fitting trade, with its usual product of new goods, and this year we think that this energetic concern, in bringing out a new steam boiler, shows more than its usual enterprise. As the company's name indicates it has from the first been very earnest in its advocacy of water as a medium for heating, and its loyalty to the faith as expressed in its name, seems to be no less now than in past years, although it has come out with a full line of steam heating goods. The explanation is found in the fact that whereas originally the company had for its competitors only concerns making hot water heaters, through consolidation of interests, the company finds itself now compelled to meet in the market other concerns controlling both steam and water apparatus, and the uniform success of the Gurney Company in producing heating apparatus should command the careful attention of those interested in steam boilers.

Michigan Association Convention.

The second annual convention of the Michigan Association of Master Steam and Hot Water Fitters was held at Grand Rapids Feb. 28, 1894. The convention was largely attended, and the proceedings were of considerable interest and beneficial to all.

The meeting was held in Elks Hall, and called to order by President Robert Sproul, with Secretary Weatherly and other officers present. The president appointed Jas. Meathe, Detroit; S. J. Wirtz, Jackson; W. W. Armstrong, Lansing, committee on credentials; Mr. John Kenny of Ann Arbor, sergeant at arms; Col. Jno. A. Wheeler, Kalamazoo; Chas. W. Light, Saginaw, and S. C. Despres, Traverse City, auditing committee. The following firms were represented:

Port Huron, James Bradley, Richardson & Gibson: Saginaw, Eureka Heating & Ventilating Co. by C. W. Light, Eureka Boiler Co. by Major H. E Light, Mgr.; Bay City, Sullivan Plumbing & Heating Co. by W. H. Sullivan, Watson & Tossell by Robert Watson, Finn & Fisher by Fred Fisher; Ann Arbor, Kenny & Quinlan by John Kenny, John O'Brien, Hutzel & Co. by T. F. Hutzel; Ypsilanti, Clayton & Lambert by J. E. Lambert; Jackson, George H. Porter, S. J. Wirtz; Kalamazoo, Wheeler & Pitkin by Col. J. A. Wheeler, S. M. Radicar; Detroit, Webster & Meathe by James Meathe, W. I. Bolt, J. W. Partlan; Grand Rapids, Sproul & McGurrin by Robt. Sproul and Capt. W. T. McGurrin, Schriver & Co. by Capt. F. S. Schriver and F. S. Schriver, Jr., Macauley Bros. by John J. Macauley, Weatherly & Pulte by W. C. Weatherly; Lansing, W. W. Armstrong, Gordon & Black by Geo. T. Gordon and Robert Black; Traverse City, S. C. Despres.

SECRETARY'S REPORT.

Secretary Weatherly made his report, stating that while trade the past season had been completely upset, each fitter being thankful for a morsel of business, so far as Grand Rapids was concerned he had noticed competition had been sharp but with less ill feeling than formerly. The Smead people the past and former years had obtained a large portion of business that should have been secured by the Master Fitters. Their hold in Grand Rapids was weak, though in other sections strong. Through the personal efforts of Chas. W. Light their methods and failures had been shown up, and the people impressed with the fact that a thorough system of heating and ventilation by steam was far more effective and economical, and that the Smead people are fast losing their hold in the eastern part of the state. It only remains for the fitters to actively enter the field with improved methods of heating and ventilation for school houses to secure that class of work would naturally come to them. Money due the State and National Associations for membership had not been promptly paid, and a considerable portion of the National dues were yet due. He suggested the appointment of a committee to consider the advisability of continuing the associations as at present or combining them, inasmuch as the really important feature for which both organizations were contending is that manufacturers and jobbers shall not sell to the consumer. Treasurer Jas. Meathe reported the condition of the treasury, and said there was a balance on hand of $100.60; the auditing committee found the treasurer's account correct. C. W. Light moved that a committee of three be appointed to consider the question of amalgamation as suggested by the secretary's report. The chair appointed as such committee Chas. W. Light, Jas. Meathe, and Col. J. A. Wheeler to report at the afternoon session. The Local Association invited the visiting delegates for a drive about the city and points of interest at 3 o'clock, and a motion to adjourn to meet at the Morton House at 5 o'clock prevailed.

EVENING SESSION.

Meeting called to order by president, and the committee on amalgamation and affiliation reported that after due consideration they deemed it advisable to maintain the separate Fitters' Association as auxiliary to the National Association for the coming year. Remarks on the adoption of the report were made by Major H. E. Light, James Meathe, J. W. Partlan, Col. J. A. Wheeler, Secretary Weatherly, and Chas. W. Light, and the report was unanimously adopted. A motion to proceed to the election of officers prevailed and resulted in the following selection: President, Chas. W. Light, Saginaw; secretary, Col J. A. Wheeler, Kalamazoo; treasurer, Jas. Meathe, Detroit.

The president was instructed to appoint all the committees desired under the constitution. The delegates received an invitation from the Grand Rapids Local to a banquet in the evening, which invitation was unanimously adopted. The officers were duly installed, and President Light named Warren C. Weatherly, Robt. Sproul, and John J. McCauley, all of Grand Rapids, as executive committee for the ensuing year, and urged an earnest and harmonious support from all members and an increased membership that the association might be better able to do good. Upon motion the convention adjourned subject to the call of the executive committee.

DRIVE THROUGH THE CITY.

The visiting delegates, representatives of the press, and Knights of Tobasco entered carriages provided by the Local Association, each carriage being supplied with a member of the Grand Rapids Local for the purpose of explaining the different points of interest visited. An extended drive was made about the city through the principal avenues. On the hill a view of the water tower, and the city below in the valley was especially interesting. Grand Rapids is truly a "Valley City" and a hustler too. After taking a bird's-eye view of the city a drive was taken through the business portion, and a stop at the City Hall was made for the purpose of taking a photograph of the delegates. From there a trip was made to the store of Sproul & McGurrin, where A. G. Alexander of Detroit displayed the merits of his new "Ben Hur" closet, and the delegates inspected Mr. Sproul's new hot water boiler in practical operation in heating their building using as fuel gas generated on the premises.

THE BANQUET.

At 8 o'clock the delegates, led by the Grand Rapids Local and under command of Capt W. T. McGurrin, President of the Local Association, marched through the business portion to the Bristol cafe, where all partook of an excellent menu; a special feature of the menu being that it was supplemented with expressions taken from trade items and shop lore. After the inner man had been well satisfied with both solid and liquid delicacies, Capt. W. T. McGurrin, President, on behalf of the Local Association, welcomed the delegates, and called on Jas. Meathe to respond to the toast, "Michigan State Association." Mr. Meathe spoke of the Association, its good to all, and the necessity of increased membership and harmonious action. "The Man who Wiped the First Joint in Grand Rapids" was responded to by Samuel Dickson of Detroit, formerly of Grand Rapids. "Benefits of Organization," by Chas. W. Light, Saginaw; "The Plumber of Twenty Years ago vs. the Plumber of 1894," by A. G. Alexander of Detroit. Mr. Alexander's remarks touched upon the pleasing manner of many of the delegates who had entertained him the evening before, and thanked them for their kind reception in room 106. "Steam Heating of the Past and Present," Major H. E. Light, Saginaw. Major Light's remarks traced the history of steam heating back for a number of years. He spoke of the older constructions and later improvements, of the wonderful development made in the last 20 years in the heating business; complimented the members on the interest taken in the organization, the good fellowship displayed, and urged them to continue on in the good work they were engaged in. "The Valley City" was responded to by Fred Schriver, Jr., in a happy vein. "Detroit the city of the next National Plumbers' Convention" was responded to by C. H. Muckenhirn of Detroit. "Bay City the Place of our Next Meeting," W. N. Sullivan Bay City, who assured thosepresent that Bay City would not only expect every present member of the Association but its largely increased membership as well. "The Knights of Tobasco" was responded to by Nicholas Spang of the L. Wolff Mfg. Co., who in a happy manner explained to an inquiring delegate the meaning of the term "Knights of Tobasco" and what they were here for. He said that uniformly they were a pleasant and good natured lot of fellows, and when apparently not in good humor it was because occasionally a number of their calls on the master fitters and plumbers brought forth the response, "No work, don't want any goods, or have placed orders for all requirements." It was not strictly the size of the order but an order of any size that softened a knight's heart and brought the sunlight of his disposition to the surface. "Diamonds and Their Relation to the Plumber" was ably responded to by Robert Sproul, who informed the assembled delegates that the vaults of the Local Trust Co. were overflowing with those owned by the members of the Grand Rapids Local. He displayed an 8 ounce diamond pawned by one of the Russian Royalty who became stranded in Grand Rapids on a recent visit and sought the plumber as a means of temporary assistance. "Steam and Hot Water Boilers," A. T. Henderson of the United States Heater Co. Detroit. "The Plumber's Tool Bag," E. J. Heatherton, editor Plumber's Trade Journal. "The Press," Jno. S. Palmer, publisher Domestic Engineering. "How Plumbing was done 30 years ago," Capt. F. Schriver, Grand Rapids. Theodore Treiber of the J. L. Mott Iron Works was called on for a recitation and rendered a very pleasant selection. In response to a request Jas. Meathe of Detroit sang "The Fine Old Irish Gentleman," and Robert Sproul favored them with a song "The French Giant."

After a vote of thanks to the Local for their most excellent entertainment and reception, the entertainment was brought to a close and the second annual convention was over, one and all feeling that to be absent was a misfortune, to be present a treat.

Among the jobbers and manufacturers present or represented were T. C. Joy & Co., Titusville, Pa., represented by T. C. Joy and C. W. Wright; Kalamazoo Radiator Co., Kalamazoo, by F. H. Prescott; The United States Heater Co., Detroit, by A. T. Henderson; The J. L. Mott Iron Works, Chicago, by Theo. Treiber; The American Boiler Co., Chicago, by O. A. Lanphear; The Eureka Boiler Co., Saginaw, by Major H. E. Light; The Shaw, Kendall Co., Toledo, by C. A. Miller; The Havs Manufacturing Co. of Erie, Pa., by Chas. Hays; The Illinois Malleable Iron Co., Chicago, by E. G. Pond; E. H. Foster & Co., Cleveland, by Edward Shepard; The Dalton, Ingersoll Co., Boston, by Oscar J. Saxe; The L. Wolf Manufacturing Co., Chicago, by Nick. Spang; Jas. B. Clow & Son, Chicago, by W H. Morse. A. G. Alexander of Detroit was displaying his "Ben Hur" closets, and Chas. Muckenhirn of Detroit was as usual wound up on the "clean sweep" specialties. Rev. W. H. Hill of the American Radiator Co. was conspicuous by his absence, which all regretted. In a communication to the "boys" he said that he regretted his inability to attend as he had been "called to another field of labor."

The past year has indeed been a discouraging one for all lines of trade in Michigan, and owing to the less than usual amount of building in Michigan both the master fitters and the master plumbers have suffered, yet we feel that the associations formed a year ago have been productive of much good. The request made by the Local, the State, and the National Associations to the manufacturers and jobbers that they refrain from quoting and selling the consumer direct has been generally complied with by the majority of them. A few, however, blind to their own interest, with a desire to be independent, have openly opposed such a request; and many who have been their friends and customers in the past have felt in duty to their own interest to give their trade to those who were willing to give protection in exchange for it. We are united not for the purpose of exacting that which is not right, but for the purpose of correcting evils that exist to the detriment of the public at large, and with a view of making our business more a profession than a mere trade.

I sincerely trust that your paper will be as loyal in the future as it has been in the past for the upbuilding and strengthening of the Master Fitters' National, State, and Local Associations.

CHAS. W. LIGHT,
President of Mich. State Fitters' Association.

The Master Plumbers of New York state assembled at Buffalo March 6, 7, and 8, the occasion being the sixth annual convention. The headquarters were at the Tifft House, the sessions being held in Metropolitan Hall. The attendance was large, and strict attention to business during the sessions was the watchword. Great progress in sanitary measures were reported by the sanitary committee, this result being aided by wise legislation. After a thorough investigation of the Smead system the committee reported they could find no sanitary advantages in it.

The report of the financial secretary and the treasurer showed that the finances were in fair shape. The association has 768 members, an increase of 45 during the year. The annual election took place at the final session. Mr. Geiger declined a re-election. The new officials are as follows: president, Wm. J. McDermott, New York city; vice president, Henry E. Weiber, Kingston, N. Y.; recording secretary, Charles Schloesser, New York city; financial secretary, Horace F. Wescott, Albany, N. Y; treasurer, Wm. Reid, Rochester; delegates at large to State convention, Messrs. Callahan of Jamestown, Barnes of Troy, Collins of New York; delegates at large to National convention, J. A. Rossman of New York and

Charles Geiger of Buffalo. The constitution was amended to a slight extent, and Troy was selected as the next convention city.

Echoes of the Convention.

Daniel G. Finerty of Boston, president of the National Association, and Vice-President Mitchell of New York, were at the convention, and made some valuable suggestions as to future work.

On Tuesday night the delegates and invited guests attended the performance of "Alabama" at the Star, about 400 being present. The management issued handsome souvenir programmes for the occasion. The orchestra played selections from the new opera Tabasco. Wednesday evening one of the gayest scenes in the history of the Builders' Exchange was witnessed. The entire building was turned over to the visitors and their entertainers. It was brilliantly illuminated and neatly decorated. The banquet table was spread in the great corridor on the third floor. The exchange floor was tastefully trimmed with flags and bunting, and potted plants added to the general attractiveness of many of the rooms and corridors. Over the rostrum in the exchange room a large banner was suspended with the words Welcome Master Plumbers. Badges and flowers were supplied and several hundred accepted the invitation. A very enjoyable entertainment, including singing by the colored quartette of the Alabama Company, piano selection by Prof. Riesberg, instrumental music by the Stauber Zither Quartette, and a vocal solo by Miss Harriett Smith of Utica was provided and speeches were made by several well-known personages including the mayor of the city. Lunch followed, and the party broke up about two o'clock, voting it a most enjoyable entertainment.

On Thursday afternoon the members were given a carriage drive to the principal points in the city and on Thursday evening attended a camp fire given by the Knights of Tabasco at Turn Hall, which was as all their entertainments are a "howling" success.

The formal and permanent organization of the Knights of Tabasco, which is an association of the traveling men in the plumbers, steam and gas fitting line, was effected on Wednesday, March 7th, at Buffalo. During the convention of Master Plumbers about 40 delegates were in attendance. A constitution was adopted and the election of officers resulted as follows: old pepper, Thomas F. Cushing, New York; young pepper, D. M. Davidson, New York; black and white pepper, Louis W. Gay, Buffalo, N. Y.; red pepper, Robt. T. Eddy, Buffalo; board of mixed peppers, Charles S. Siddons, Buffalo; I. L. Hamill, Albany, Philip Beecher, Syracuse, John J. Cary, Baltimore, Frank J. Rouske, New York. The Knights have adopted two series of yells which will have to be heard to be appreciated. It was resolved to meet in Troy next year at the same time as the Master Plumbers meet.

Convention Notes.

The American Radiator Co. was represented by Joseph Bond, its president, and Mr. Snow, its New York state representative.

The New York Central Iron Works of Geneva, N. Y., were ably represented by C. H. Williams and C. H. Wood, the latter of their Southern office at Knoxville. They presented everyone with a circular called "Queries of the Convention," which was illustrated with cuts of portable and brick set boilers such as they manufacture.

The Powers Duplex Radiator Co. of Chicago was represented by W. P. Powers, president, who has been East and met with favorable success in introducing their regulator in connection with the hot blast system in school work.

Buffalo up to Date was the title of a little booklet given away at the convention by the Buffalo local, which contained much valuable information about the city.

The Standard Radiator Co., through D. P Hughes, general agent, had on exhibition at the Tifft the first of their new radiators. It is artistically designed and has the same connection top and bottom as the regular standard and has all its important features besides being lighter and more graceful looking, It should be seen to be appreciated. It attracted great attention and was favorably commented on. We shall be glad to show our readers an illustration of it in the next issue.

The Niagara Radiator Co. was represented by C. F. Walther, general manager, who showed two of their radiators which were illustrated in the January number of this journal. They were of the Louis XVI style, and made a beautiful exhibit. Attached to them was the new valve wheel manufactured by W. F. Greene of Troy, which we illustrated in our February issue.

W. F. Greene of Troy gave away samples of his new, "always cold" valve wheels to members. It is a most valuable addition to a steam radiator valve.

The Electric Boiler Co. of Rochester was represented by C. S. Hopkins, vice-president, who presented everyone with their latest illustrated catalogue.

J. D. Stiles did the honors for the Jenkins valves, the wonderful popularity of which he loses no chance to increase.

Daniel Kennedy, the inventor and president of the Kennedy Valve Co., greeted all his old friends with a smile, and pocketed very quietly all orders that were lying around loose.

John Simmons & Co. know a good thing so they keep Tom Cushing right under their wing, and he—well, he don't forget—but is always ready for business, and they say he gets it too.

The Herendeen Mfg. Co. of Geneva occupied parlor 230 where W. L. Herendeen, F. A. Herendeen, and last but not least, F. J. Furman, superintendent and inventor of that well known boiler, received their friends and, of course, captured them.

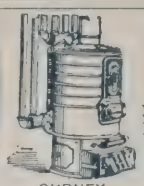
Chas. A Campbell of the New York office of the American Boiler Co. greeted old friends and made lots of new ones.

The trade press was represented by J. M. Hetherton, Jr., and Col. Hetherton of the Plumbers Trade Journal and John M. Palmer of Domestic Engineering of Chicago.

HEATING AND VENTILATION desires to thank the members and others for courtesies received.

(*Continued on page IX.*)

Gurney


GURNEY.

THEY LEAD EVERYTHING.

Send for our literature and you will see why the Gurney Heaters are yet

COMPLETELY UNRIVALED.

HOT WATER HEATERS AND RADIATORS FOR HEATING Dwellings, Public Buildings, Etc. BY HOT WATER CIRCULATION.

Gurney Hot Water Heater Co.

HEAD OFFICE: 163 Franklin St., Boston, Mass.

BRANCH OFFICE: 59 Wabash Ave., Chicago, Ill.

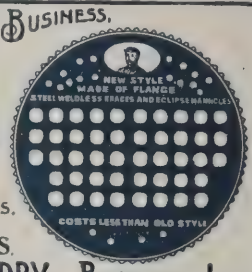
SELLING AGENCIES: Johnson & Co., 71 John St., New York. C. F. Trachsel, 246 Arch St, Philadelphia.


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BEING IN THE BOILER BUSINESS,

MAKING STATIONARY TUBULAR BOILERS EXCLUSIVELY.

WE CAN MAKE A BETTER BOILER AND ALTHOUGH WE MAKE THEM OF FLANGE STEEL WITH WELDLESS BRACES AND ECLIPSE MANHOLES SELL THEM FOR LESS MONEY THAN OLD STYLE ONES.



WE FURNISH NEATER LITHOGRAPHS AND DETAIL ILLUSTRATIONS OF THIS CLASS OF BOILER THAN ANY FIRM IN THE UNITED STATES.

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ORDER PLUMBING ORDER

GAS WATER STEAM

ORDER Supplies of ORDER

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Sanitas Regal Closet.

OUR LATEST PATTERN.

The same in principle as previous patterns, but with larger bowl and vent, and several other improvements.



The seat is attached directly to the Pottery, dispensing altogether with Seat Brackets. The name "SANITAS" is synonymous with *Safety*, *Simplicity* and *Science*, and in no plumbing appliances are these qualities so perfectly combined as in the "SANITAS REGAL CLOSET."

Our New Catalogue for 1894 is now ready for Distribution.

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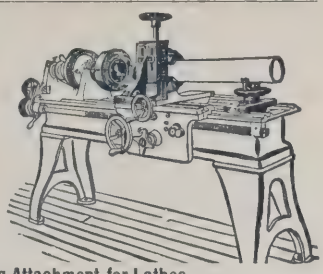
THE LOSS OF THE KEARSARGE

was one which aroused the sentiment of the whole nation, but the loss of trade is of a great deal more importance to you. Your competitor puts in new and modern machinery for cutting and threading pipe. Don't let him get ahead of you, but order at once pipe cutting and threading machines from us.

Forbes' Patent Die Stock, Pipe Cutting and Threading Machine for Hand or Power. Also Pipe and Bolt Threading Lathe Attachment.

SEND FOR ILLUSTRATED CATALOGUE.

CURTIS & CURTIS, 46 Garden Street, Bridgeport, Conn.



Portable Hand Machines we make enable one man to cut and thread 8 inch pipe. The Curtis Pipe and Bolt Threading Attachment for Lathes.

The Shackelton Steam Radiator Co. will build a large plant at Alexandria, Ind.

The New York office of G. & J. R. Bolton will be removed from Cortlandt to 230 Water street.

The Wilson heaters, made by the Stove Heater Co., Freeport, Ill., will hereafter be known by the name of "Cuba."

The American Boiler Co. will hereafter manufacture the "Spence and Soleil" boilers at the new plant in Syracuse.

The Illinois Plumbing and Heating Co. have opened offices at 257–261 Dearborn street, Chicago. This is a new company.

The "Mascot" is the name of the new steam heater for small work to be placed on the market immediately by the U. S. Heater Co. of Detroit.

The principal offices of the American Boiler Company heretofore located at 34 and 36 Dearborn street, Chicago, Ill., are now at 84 Lake street, the former western office of the Richardson & Boynton Co., who do not need as much room, and will be located on the next upper floor. The new store is 102 feet deep, and has an ample basement for stock, while in the front can be shown a large variety of samples, the rear being used for offices.

(Continued on page X.)

WANTED.

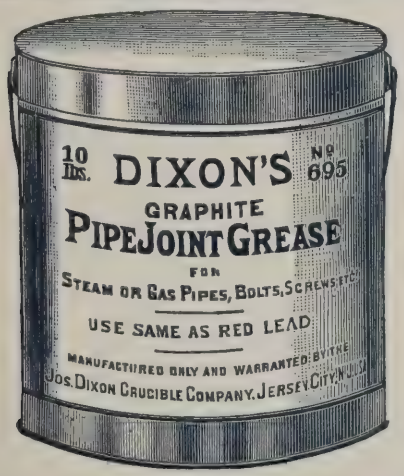
Announcements in this department will be inserted at the uniform rate of twenty-five cents per line. For five or more insertions of the same advertisement we make a discount of 10 per cent. Calculate on nine words to a line.

WANTED.—Agents visiting engine and boiler rooms can learn of profitable side line, with full particulars as to handling, by addressing the Michigan Lubricator Company, 661-669 Beaubien St., Detroit, Mich.

WANTED—A pattern-maker. We want a first class pattern-maker to make patterns for cast iron stoves and hot-water boilers. Apply at once, stating age, experience, who you have worked for with references, and wages desired. Address Herendeen Mfg. Co., Geneva, N. Y.

WANTED—A salesman in every town and city to sell our Faultless Furman Steam and Hot Water Boilers; an energetic, clear-headed man can make big wages and have steady employment by addressing the Herendeen Mfg. Co., Geneva, N. Y.
Cut this out, as it will not appear again.

WANTED.—An active man, acquainted with architects and the plumbing and steam heating trade, to take position as solicitor in New York and vicinity with established manufacturing house. Address, giving name and present or recent business connection, Alexander, care HEATING AND VENTILATION.



FAR BETTER AND CHEAPER THAN RED LEAD

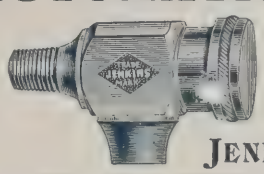
Makes a tighter joint than red lead, that can be opened with perfect ease many years after.

Invaluable for all steam, gas and water piping, and equally useful for smearing gaskets on flange joints of meters, traps, and for bolts, screws, etc.

JOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.

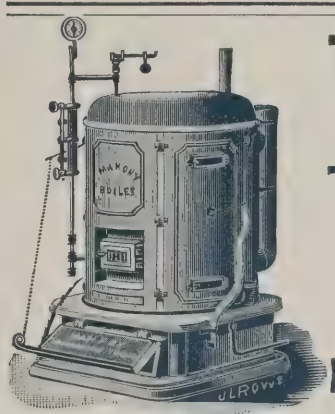
JENKINS AUTOMATIC AIR VALVES.

OVER 200,000 IN USE.



Years of actual test in the hands of the public prove them to be all we claimed for them, being the simplest, easiest applied, most sensitive and durable. Indorsed by the leading steam experts as the best made and quickest working.

JENKINS BROS. NEW YORK, BOSTON, PHILADELPHIA, CHICAGO.



THE MAHONY BOILERS.

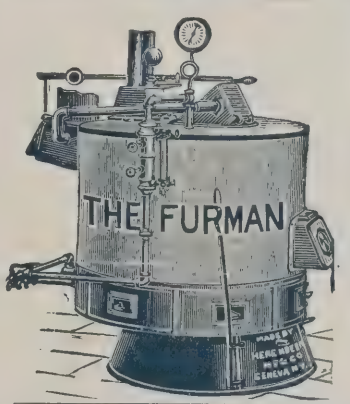
For Steam or Hot Water.

THOUSANDS IN USE,

And all Giving Satisfaction.

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Economical-Substantial-Safe.

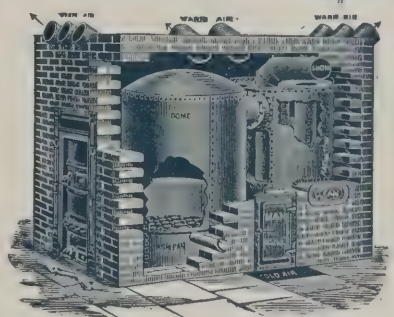
OVER 150 STYLES AND SIZES.
BURN HARD OR SOFT COAL.

STEAM AND HOT WATER HEATING.

These Boilers have a high reputation for Stanchness, Durability and Safety, and are **GREAT COAL Savers. ALL SCREW JOINTS,** Iron to Iron, which cannot leak—**VERTICAL,** hence rapid circulation. Send for our new illustrated catalogue giving full particulars and a great deal of valuable information. Address

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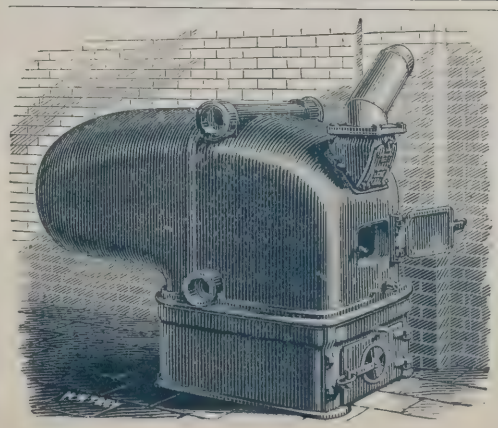
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Warming and Ventilation of School Houses,
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INDIANAPOLIS, - - - INDIANA.



HITCHINGS & CO.,

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Hot Water Heating Apparatus

for Greenhouses Conservatories, and Dwellings.

ALSO

WATER HEATERS FOR BATHS.

5 Styles of Boilers, 24 Sizes.

Send 3 cents postage for catalogue.

Janes & Kirtland, N. L. Cort, and the Perry Stove Co. will soon remove their New York offices to other locations.

Disbrow & Co. have succeeded to the business of the Harrisburg Boiler & Mfg. Co. J. A. Affleck will manage the company.

Mr. J. R. Bolton, one of the inventors of the G. & J. R. Bolton heaters, now residing at New Haven, Conn., has joined the ranks of the benedicts and is opening a fresh box of cigars. Have you called?

The traveling postal of the United States Heater Co. of Detroit, is at hand. A comparison of advantages and defects show why their heater is superior to many, and serves to keep their name before the trade all of the time.

The Board of Education, Oklahoma City, O. T., has contracted with The Bennett & Peck Heating & Ventilating Co., Cincinnati, O., for their complete system of heating, ventilating and closets in four eight-room school buildings, which will be erected in that city during the coming summer.

The History of a Lead Pencil by Walter Day, published by the Joseph Dixon Crucible Co., is the latest novelty, fresh from the press, issued by this enterprising company. It contains lots of interesting reading in it too. Who among our readers ever stops to think of the amount of capital invested in the industry and the very interesting process of manufacture. Few probably, but you can find out easily by sending for a copy.

The Standard Dry Kiln Co. have removed their main office from Louisville, Ky., to Indianapolis, Ind., in order to secure for their rapidly growing trade a more central distributing point than their southern location afforded. Equipped with increased manufacturing and unsurpassed shipping facilities they can more readily cater to the wants of manufacturers in their line. The new location is 184 South Meridian street, opposite Union Depot, Indianapolis, Ind.

The American Fuel Economizer Co. of 136 Liberty street, New York, favor us with a new catalogue, just issued by them. A description of their heaters for purifying feed water for steam boilers by utilizing the heat in flue gases is given, amply illustrated with well made cuts. What the economizer accomplishes, directions for care and operation and standard sizes are given, besides useful data for engineers such as pressure of steam in pounds above atmosphere, properties of saturated steam, table of electrical horse powers, proper proportion of chimneys for steam boilers, etc.

We are in receipt of the 1894 catalogue of the School House Construction Co. of Peoria, Ill., which describes the Dickson system of construction, guaranteeing 2,000 feet of air per hour for each pupil. The work has as prominent features, "How to Build a School House," "Air Circulation in the School Room," "The Greeley School," Peoria, illustrated, "Architects," "How the Average Board Selects a Plan," "The Right Way," "Advice to School Boards," "Selecting a Plan." The Dickson dry closets and urinals are shown with cuts. The catalogue sent free on application to those mentioning HEATING AND VENTILATION.

Fuller and Warren Co., of Troy, N.Y., send us the first copy of their new work for 1894 specially illustrating warm air, combination, and hot water heaters. Like all matter gotten up by this company it is well printed. The front cover has the company's well known trademark, and the back cover has an illustration of their great factories. To give our readers an idea of the matter contained in this work would take several columns. We may mention that all their latest novelties are shown, and prices on warm air heaters are so low that you better write and get one for yourself. It costs you nothing if you say you saw n HEATING AND VENTILATION.

The Foskett & Bishop Co. of New Haven, Conn., have the following hot water contracts on hand in New Haven, Conn.: Prof. Marvin's new house, Lake Place; Capt. Magnus Mansor's new house, Dwight street; J. Willis Downes' new house, Howe street; J. R. Lyons of Cox & Lyon, hardware merchants, new house, Ellsworth avenue; P. E. Whalen, contractor, new house, Winthrop avenue; Prof. G. A. Low, new house, Reynolds street; Capt. O'Keefe, new house, Orange street; Walter Leigh, clothing store, Church street; new parsonage, North Haven, Conn.; E. B. Munson, Whitney avenue and Cottage street; plumbing and heating of new Stubinger Block to be built on Chapel street. They are also doing all the heavy piping at the new power house New Haven Street R. R. Co.

As we mentioned in our February number, Smith & Winchester of Boston have adopted a unique plan for naming their boiler, and for the benefit of our readers we print below the official announcement.

"We have decided to place a new steam and hot water heater of our own manufacture on the market the coming season, and wishing the trade to share the glory with us, propose to let them name it. Our plan is that every dealer shall be entitled to suggest a name, and to the first one suggesting the name selected by the judges as best and most appropriate we will present one of our heaters for either steam or hot water, of the twelve different sizes we shall make, delivered free of expense at his nearest railroad station.

The following gentlemen will act as judges,—Mr. L. H. Hart, manager of HEATING AND VENTILATION, the editor of The Metal Worker and M. E. R. Pierce, manager Boston office American Radiator Co.

The contest will close March 15th, 1894, after which a complete list of the names suggested will be submitted to the judges for their consideration and final judgment. Fill out the blank and return to us in the stamped envelope, both of which we enclose, which will be numbered and placed on file immediately on receipt at this office.

The result will be published in all the principal trade papers as soon as the judges' decision is received, with a portrait and short reading notice of the lucky person, if desired.

As all replies will be numbered in order received, we would suggest that you send us your selection at the earliest possible moment, as order of receipt will determine the fortunate person in case two or more suggest the same name."—SMITH & WINCHESTER CO.

(*Continued on page xi.*)

EST. 1857.



YOUR STOCK

is not complete unless you carry a line of

WILKS WATER HEATERS, TANKS AND STEAM GENERATORS.

For all purposes for which Hot Water or Steam is required.

Oldest Manufacturers. *Best Goods.* *Prices Right.*

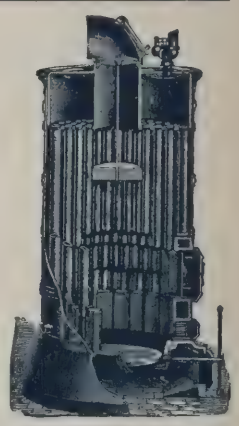
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S. WILKS MFG. CO.,

Mention H. & V. 113 to 123 Clinton Street, Chicago, Ill.

A Package of Satisfaction

goes with every one of our Heaters. It's in the fire-box of every boiler. You can't see it, may be, but it's there. The man who uses the boiler will find it.



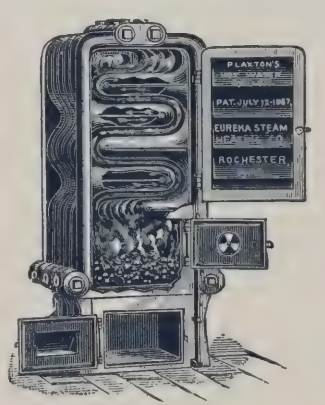
"EQUATOR" STEAM BOILER. "GULF STREAM" HOT WATER BOILER.

The construction is such that the greatest possible boiler surface is exposed to the direct radiation of the fire. The drop tube system is used and the ratio of fire surface to grate area is nearly 40 to 1. These boilers are both easily and quickly set up—more so than any others. That is a feature worth considering. We'd like to send you our book.

A treatise on the selection of a House Heating Boiler sent free to any address upon application, also a book of Estimate Blanks issued for use of contractors in keeping a complete record of each plant installed, and specifications for steam or water apparatus.

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PLAXTON HOT WATER HEATER

Excels all other Heaters in respect to

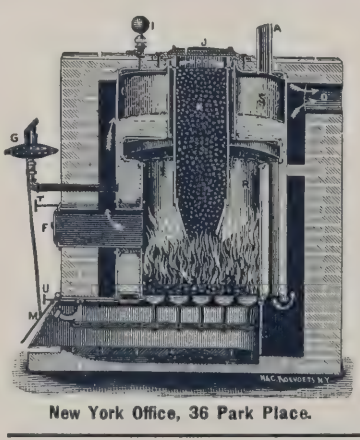
SIMPLICITY OF CONSTRUCTION.
ECONOMY OF FUEL.
EASE OF CLEANING.

The Cheapest Heater on the market when results are considered.

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TABASCO

Should always recommend the "DUNNING" Boiler because it's "Hot Stuff." So hot that it heats a house just right.

19,000 in practical use

shows the great popularity of these heaters. Made for Steam or Hot Water. 40 years' experience. A catalogue for the asking.

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G. & J. R. Bolton Heater

FOR HOT WATER.

All of Messrs. Bolton's Latest Improvements

MANUFACTURED BY

THE FOSKETT & BISHOP CO.

New Haven, Conn.

NEW YORK OFFICE, 114 Liberty St. Send for Catalogues and Drawings.

H. P. Blair & Co., 118 Colfax avenue, South Bend, Ind., are a new heating firm.

If you are interested in gas stoves and ranges, send for the new catalogue of the Quick Meal Stove Co., St. Louis, just out.

The Bridge & Beach Mfg. Co., St. Louis, Mo., are erecting a new and modern foundry for the manufacture of stoves, and it will probably be ready for occupation May 1st.

Thomas Weathered's Sons, 244 Canal street, New York city, are doing a great deal of greenhouse heating in this vicinity, in Seabright, N. J., Bayonne, N. J., in Brooklyn, and in Yonkers, N. Y.

The J. L. Mott Iron Works have secured the contract for heating the Paterson high schools, the system they submitted having been decided upon after careful consideration of the Smeed and other systems.

Davis, Johnson & Co., 45 Jackson street, Chicago, will handle the "New Idea" furnaces, manufactured by Schill Bros., Crestline, O., exclusively in the future in the states of Illinois, Iowa, Wisconsin, and Missouri.

The Barron Steam Heating Co. have removed from 43 Dey street to the Cable Building, Broadway and Houston streets, where they will have most excellently appointed offices and reach the trade they cater to more directly.

The Broadway Central Hotel, 667 Broadway, New York, will send, upon the application of any fitter, a first-class map of New York city and a circular giving rates, etc. If you intend to be at the convention in June it would be well to look after your rooms at once.

The Excelsior Steel Furnace Co., of Chicago, have moved to 38 Monroe street, same city, where they will occupy the whole of a new five-story building and basement, in all about 60,000 feet of floor space. The offices will be in the front on the second floor.

The New Horizontal Tubular Boiler for low pressure heating purposes, invented by Thomas Pheasy of Cleveland, Ohio, is to be manufactured by a stock company known as the Pheasy Tubular Boiler Co., with a capital of $100,000. Extensive works will be erected in Cleveland.

We have received through Mr. W. S. Mappett of the Richmond Stove Co.'s New York office, a very pretty ash receiver or pen and pin holder designed in the form of a peacock and making a useful desk ornament. The "Richmond" people are always up to the times and never mean to let the trade forget them.

The Board of Education, Clarksburg, W. Va., will erect a new High-School building, during the coming summer. They have already contracted with The Bennett & Peck Heating & Ventilating Company, Cincinnati, O., for heating, ventilation and dry-closet work. The new Presbyterian church, this city, is to be heated and ventilated by the same system.

The Thatcher Furnace Co. have outgrown their present quarters at 33 Peck slip, and, as mentioned in our last number, will shortly remove to 240 Water street, when they will occupy the whole building. The present management of the company, who have been in charge about five years, have made a remarkable success, and this summer will see a doubling of their foundry capacity. They are now manufacturing a line of steam and hot water boilers which we illustrate in this issue.

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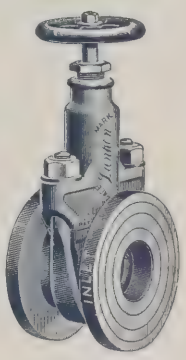
- - - SEAT GATE VALVE. - - -

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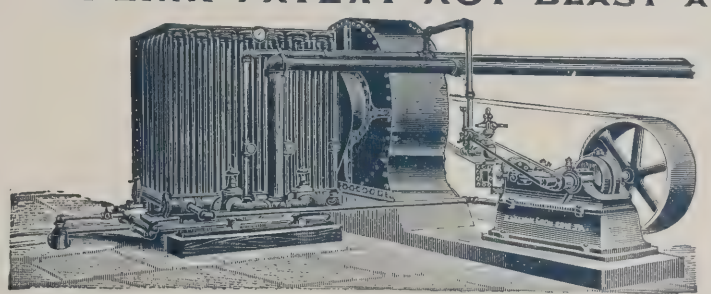
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Which, for drying and heating purposes, has no equal. We build them having the direct attached engine, which may be preferred on account of economizing space.

Using exhaust steam we will GUARANTEE to heat more cubic feet of air with a given amount of pipe than any other heater in the market.

Our heaters are made of the very best material, by skilled workmen, and each heater section is tested, to 120 pounds steam pressure before leaving the factory. Correspondence solicited.

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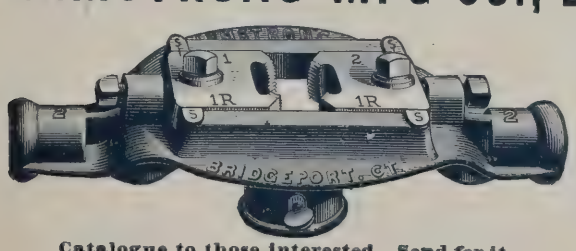
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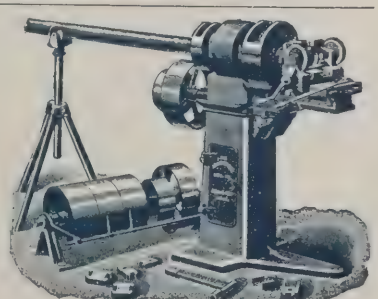
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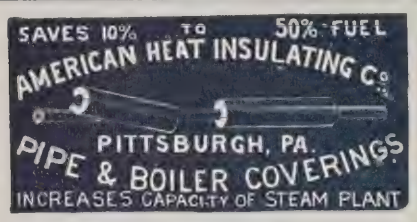
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Pale & Rich Gold, $1 00 lb. Orange & Copper, $1.00 lb.
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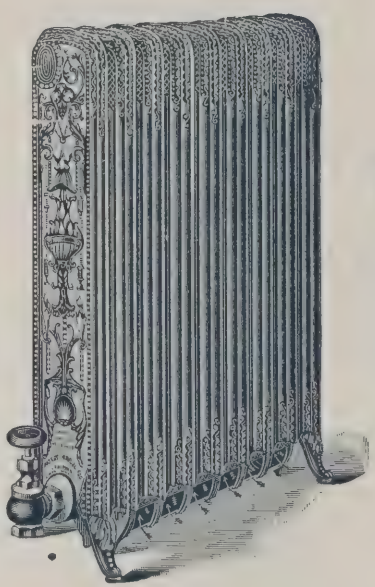
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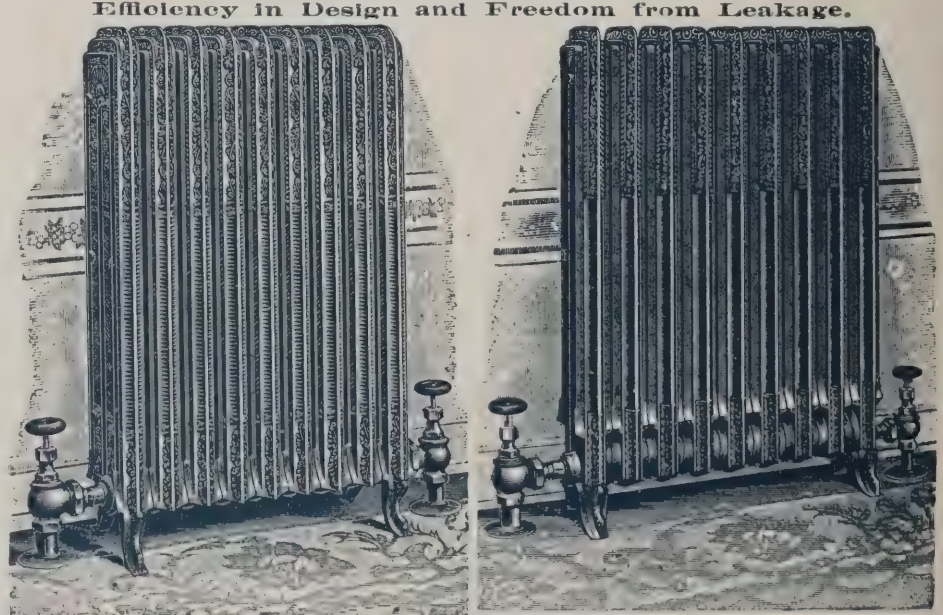
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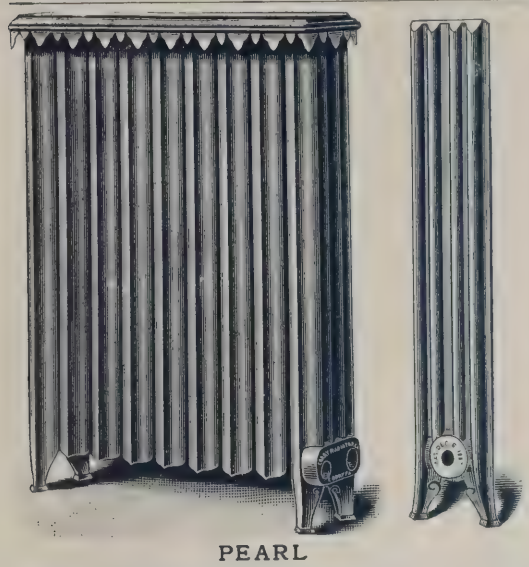
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Improved Flue Radiators

FOR STEAM AND WATER.



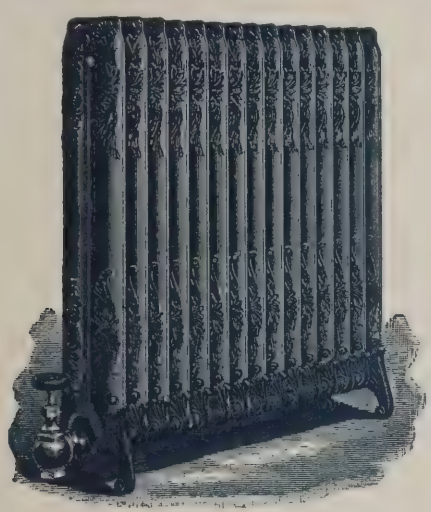
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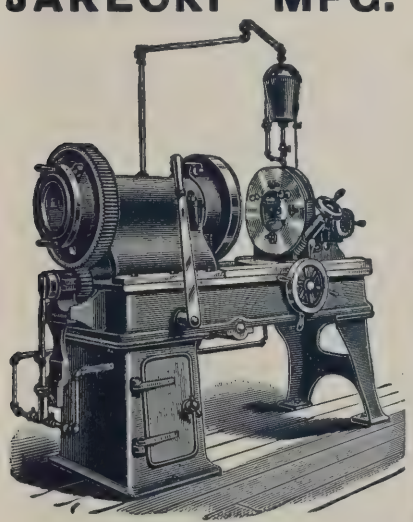
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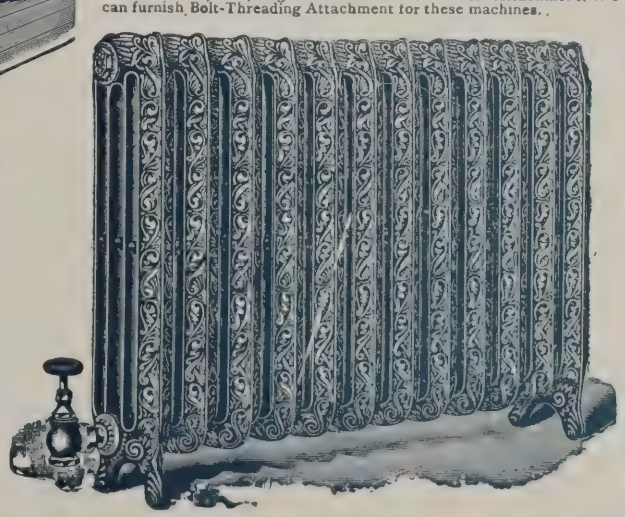
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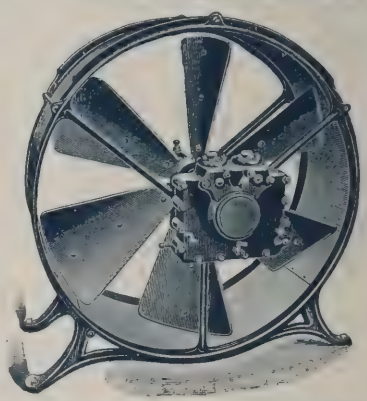
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View of Fan with Engine attached.

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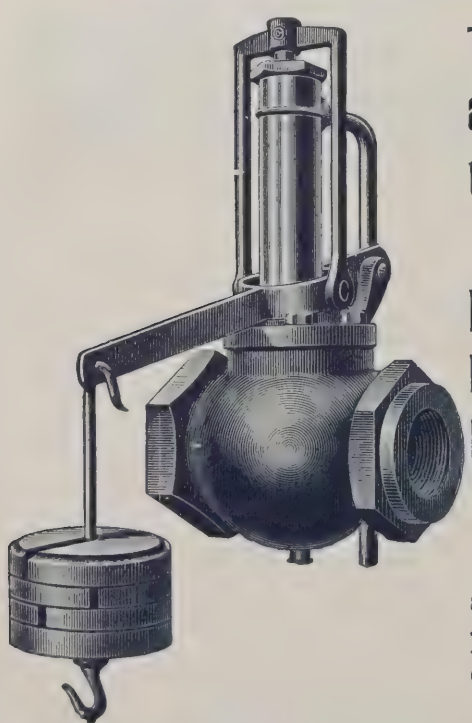
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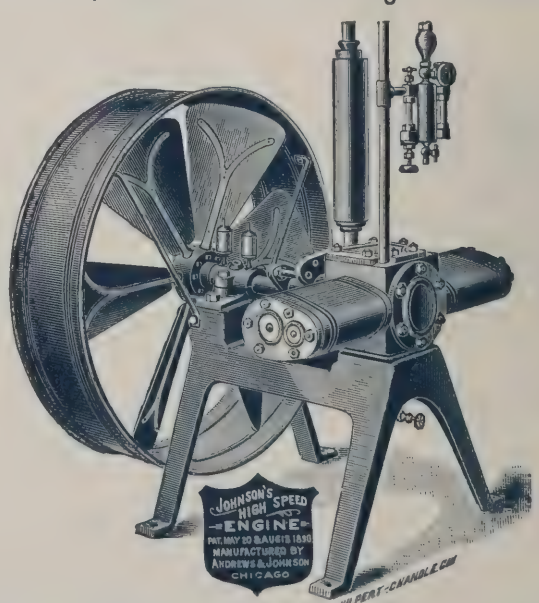
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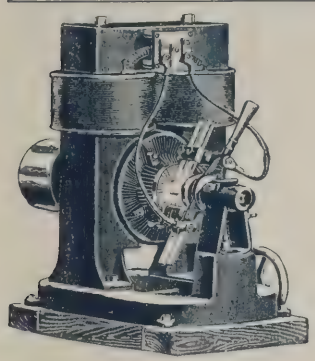
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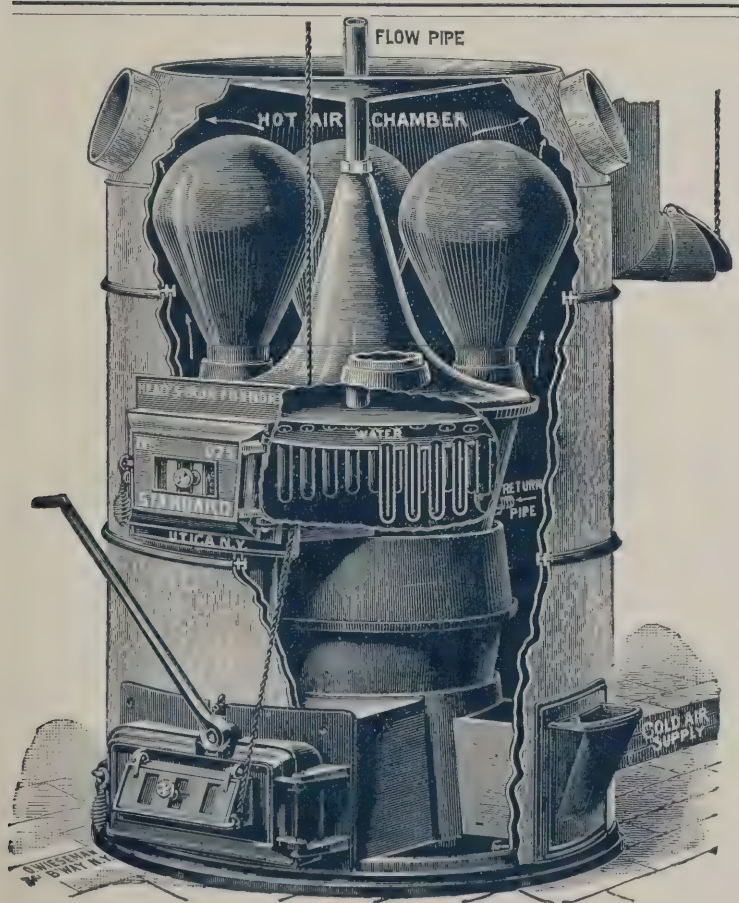






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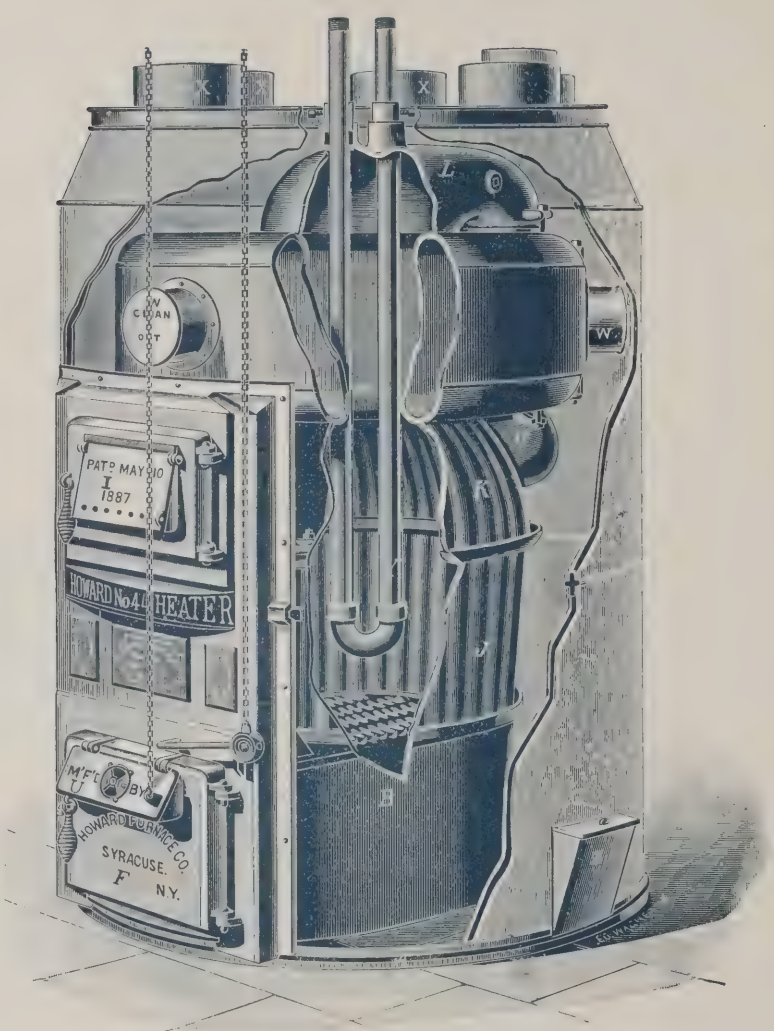
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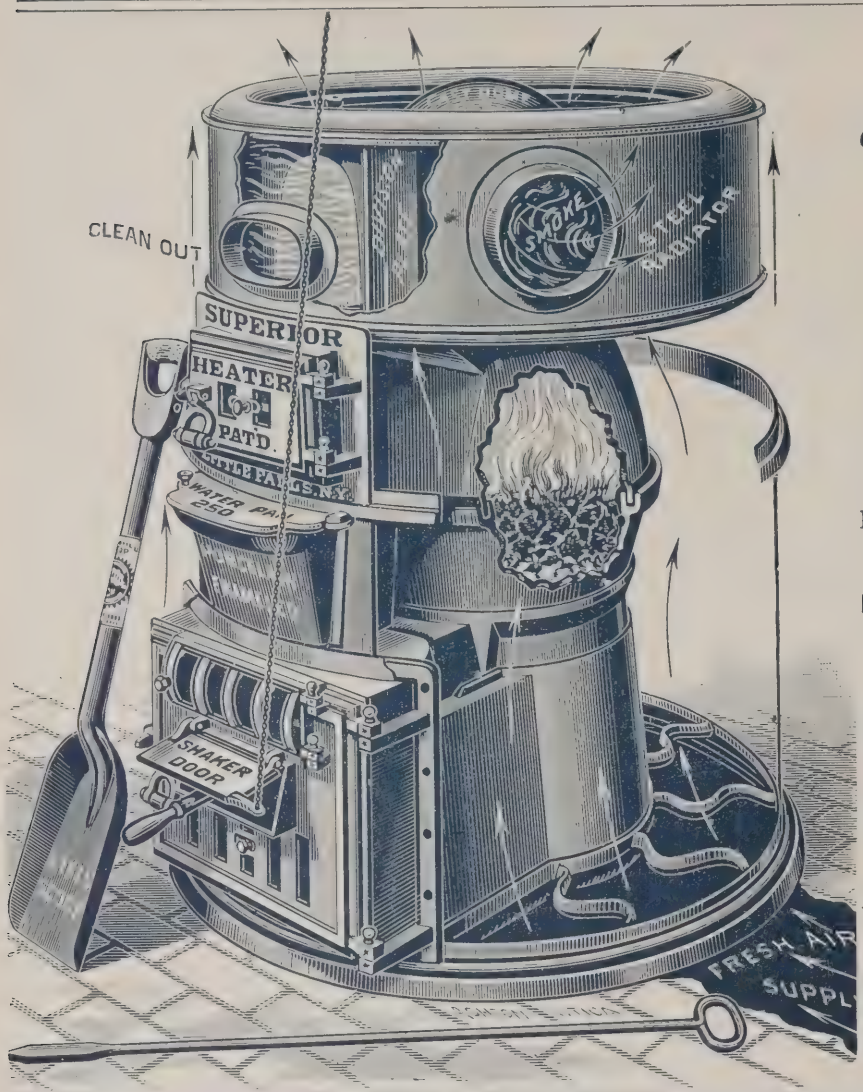
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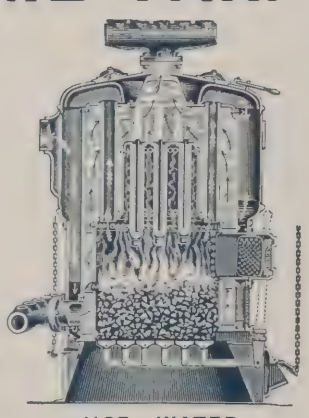
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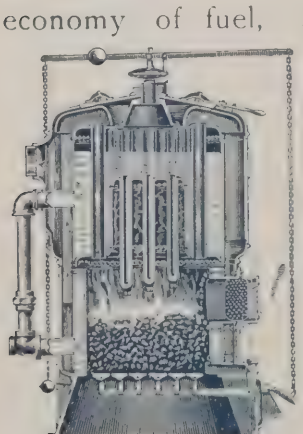
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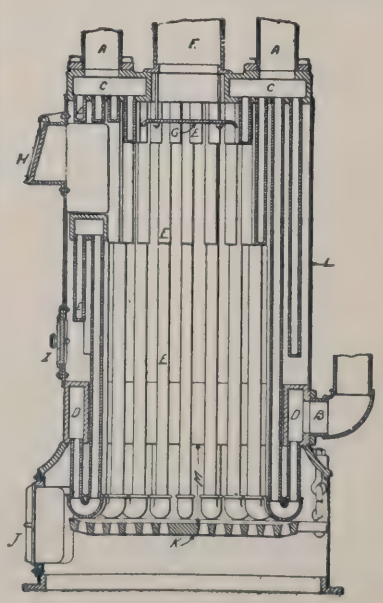
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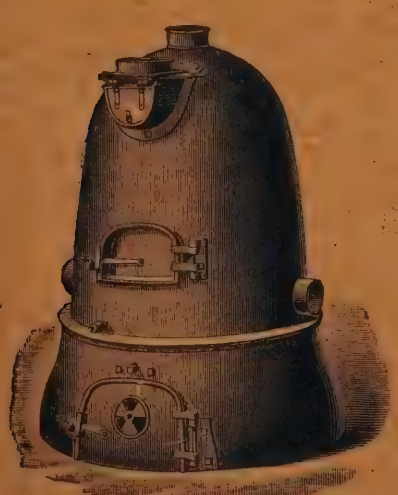
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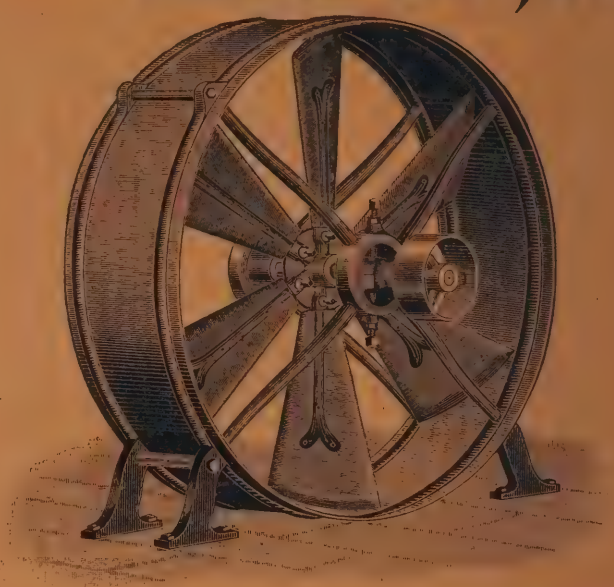
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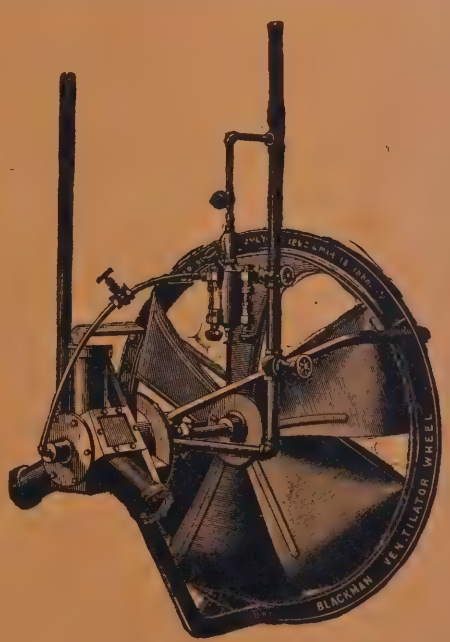
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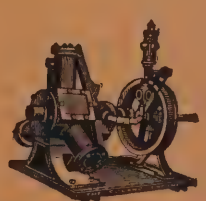
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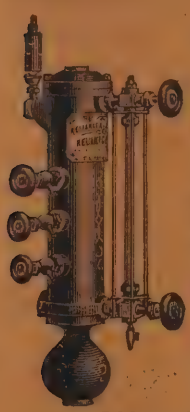
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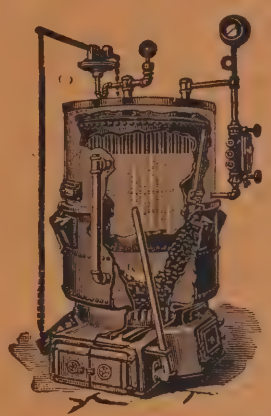
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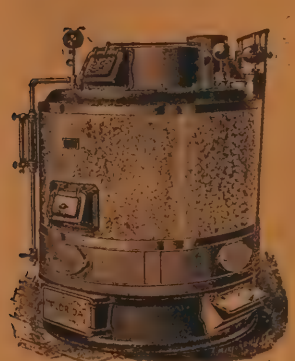
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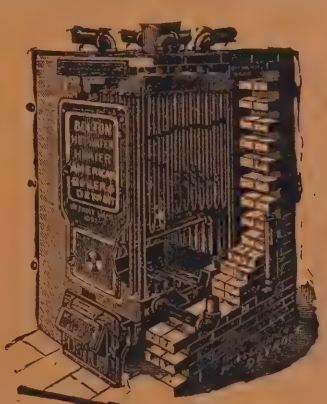
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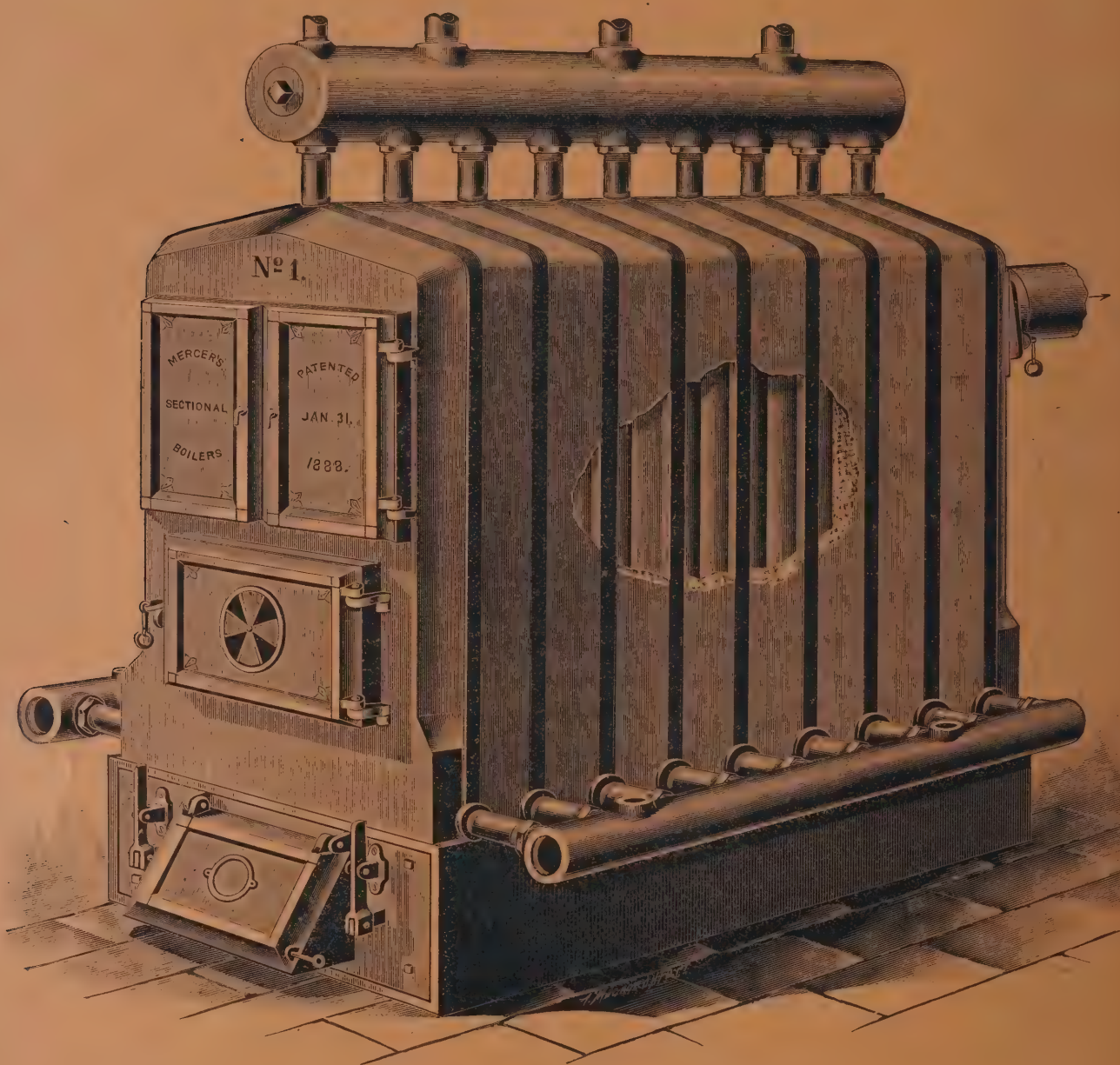
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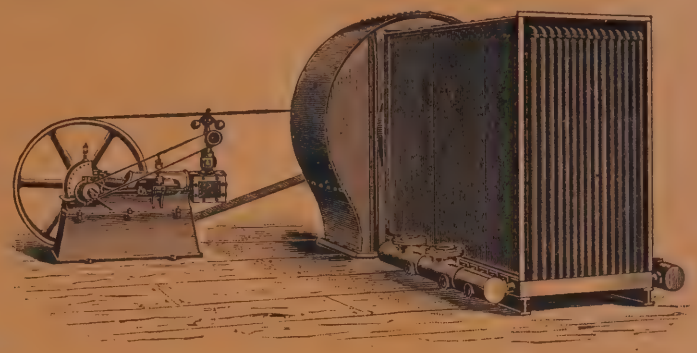
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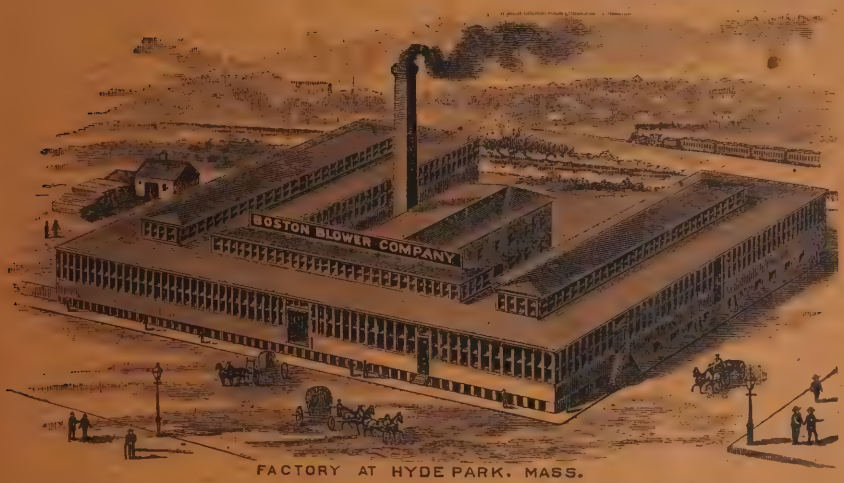
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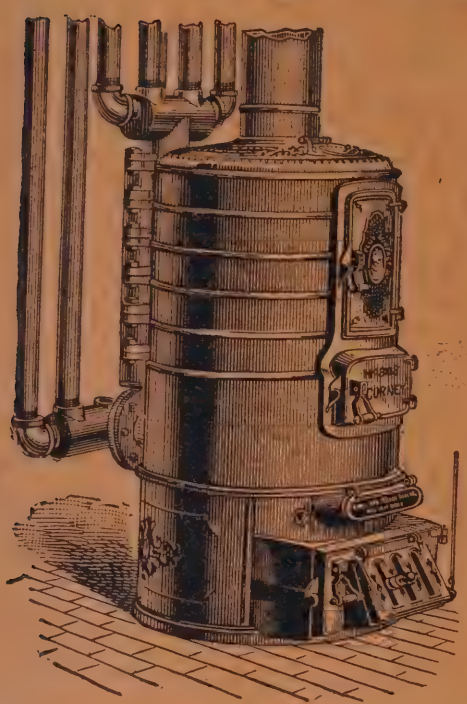
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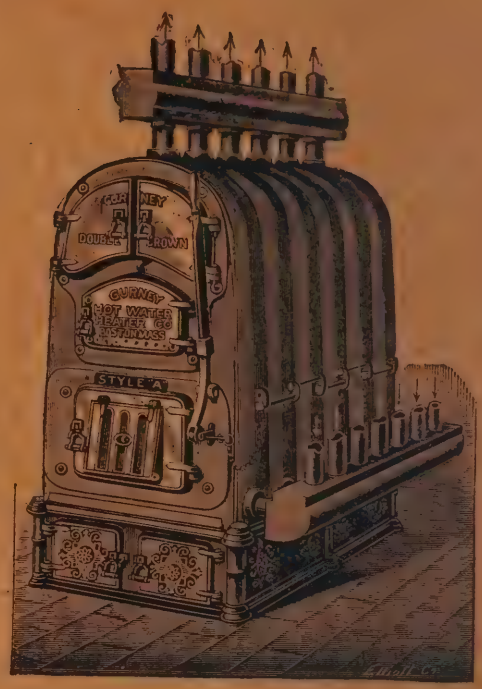
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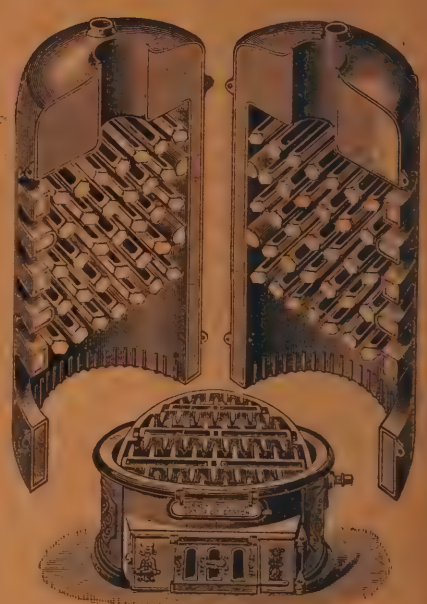


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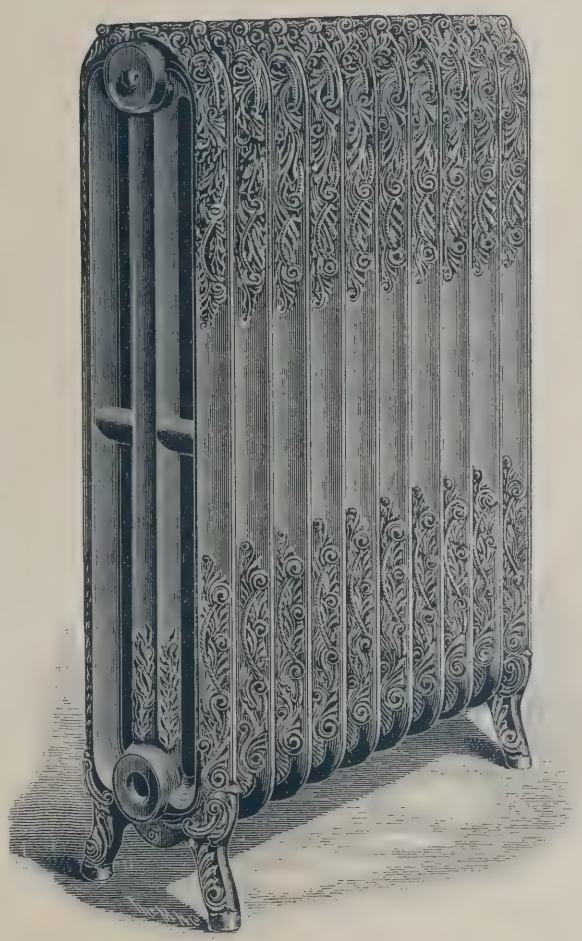
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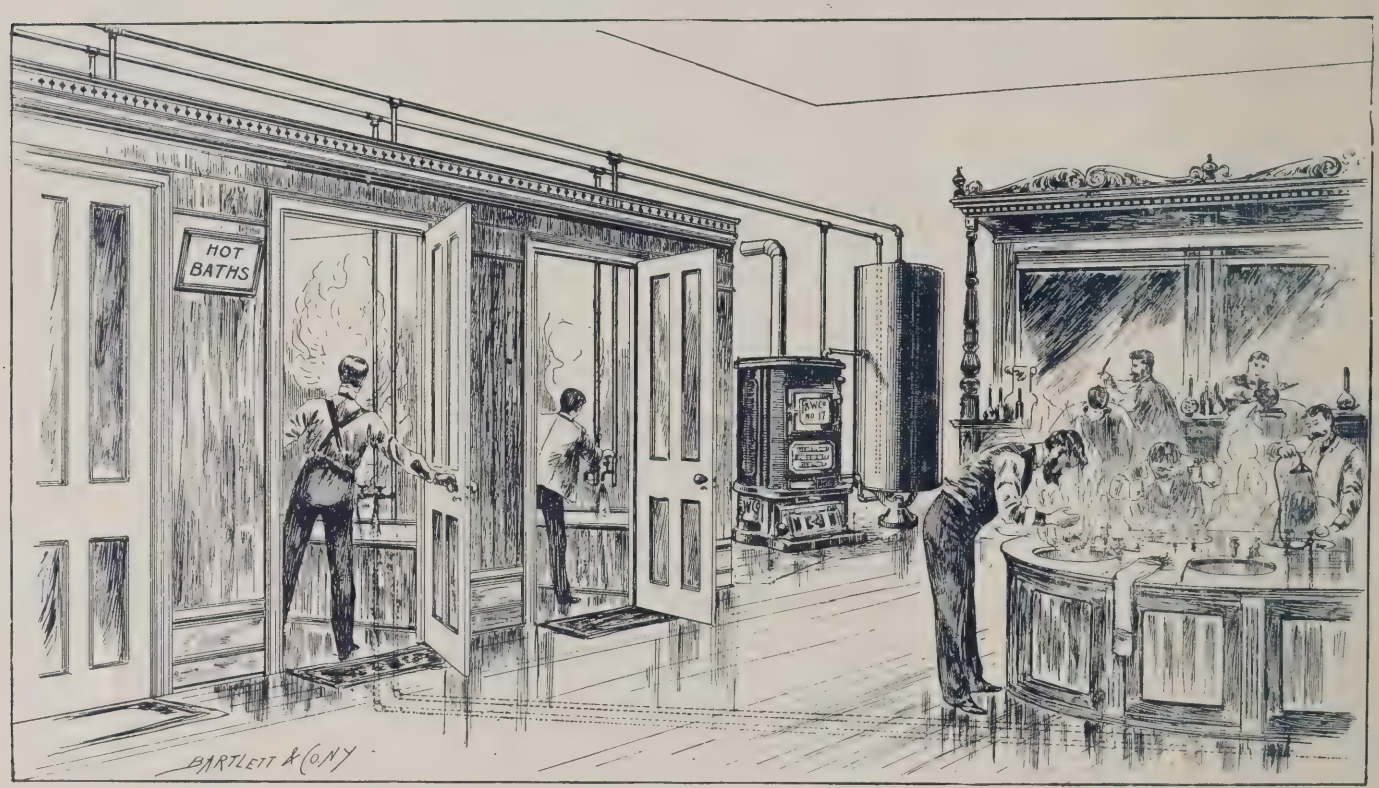
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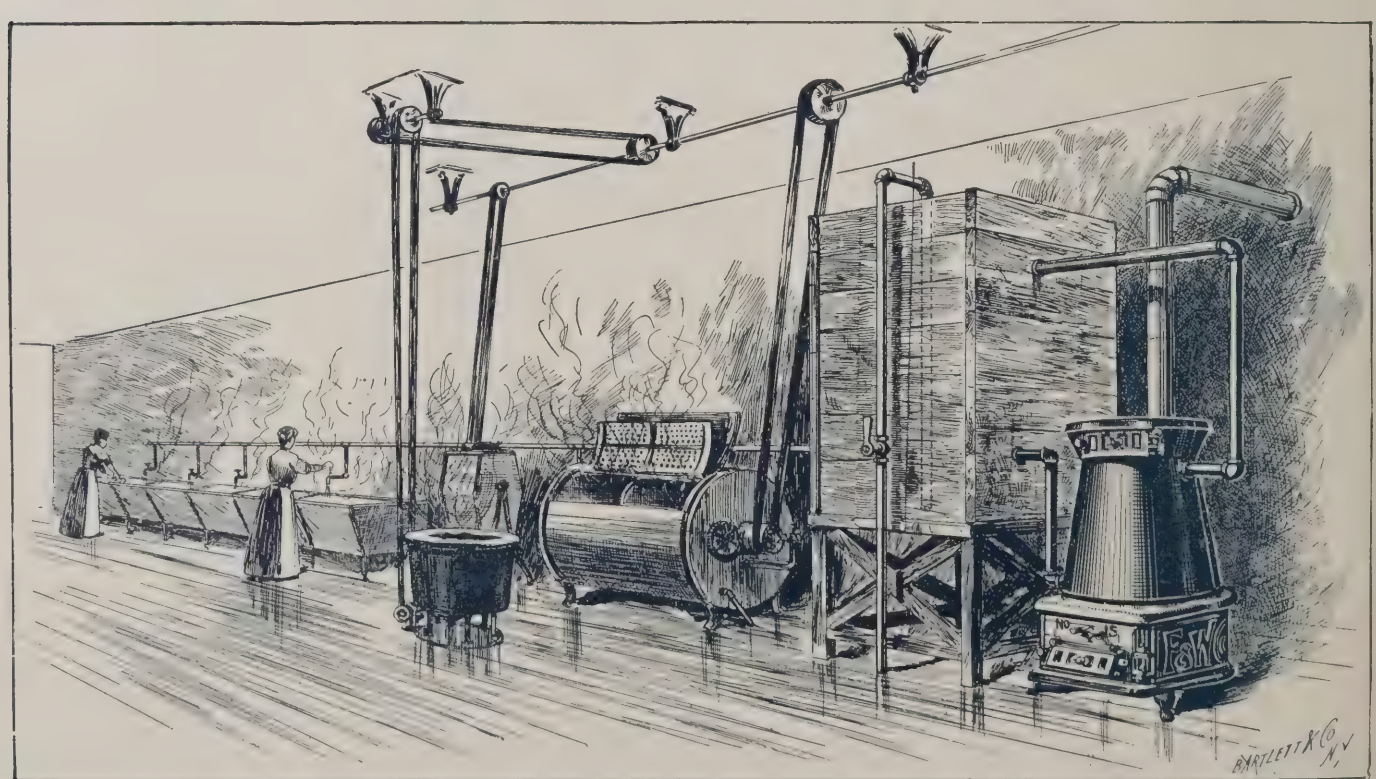
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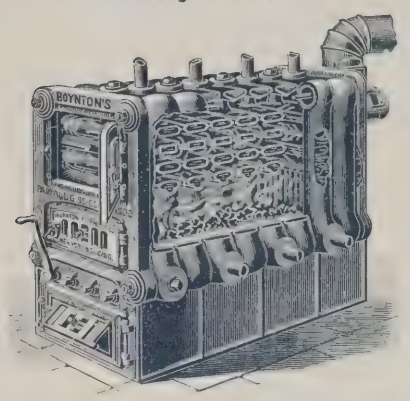
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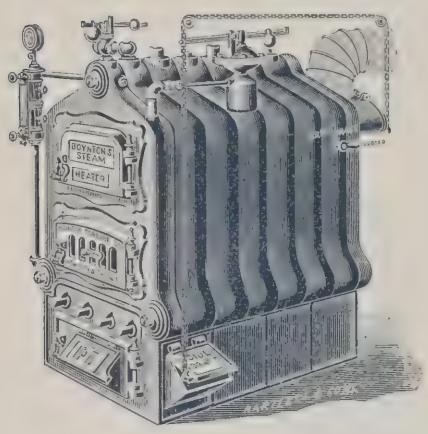
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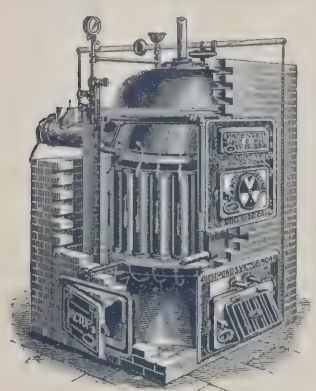
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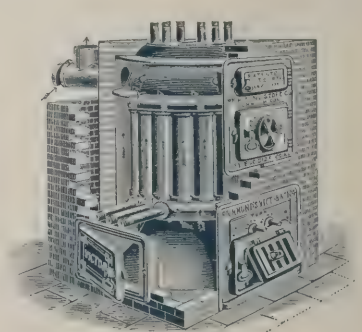
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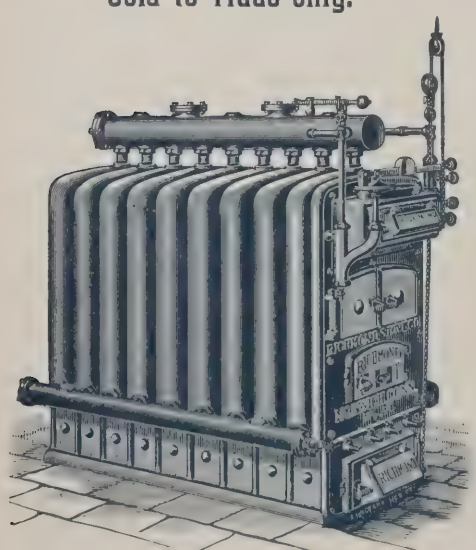


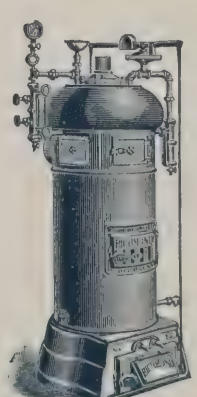
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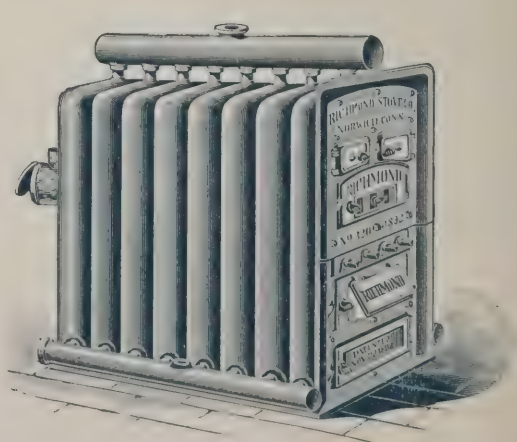
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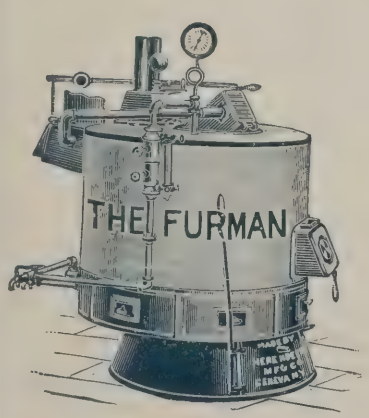
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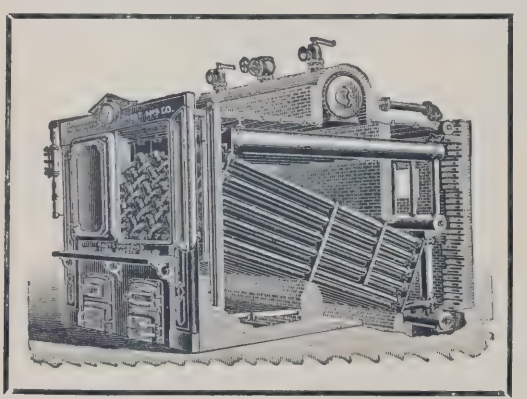
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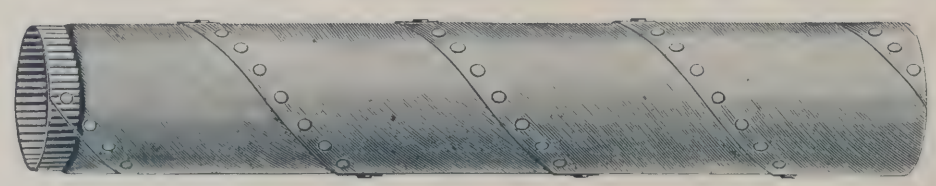
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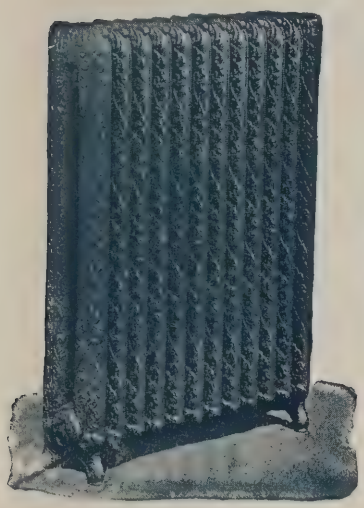
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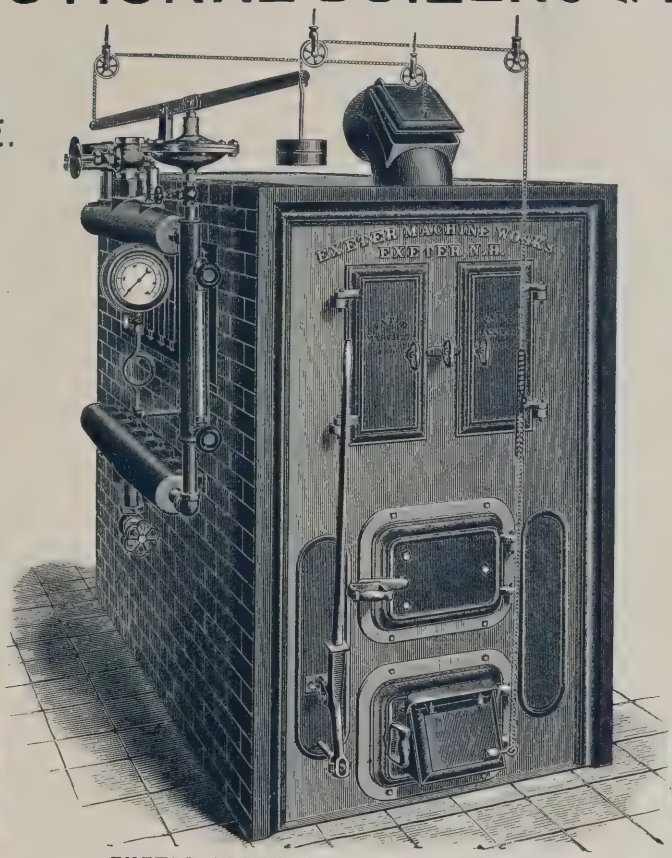
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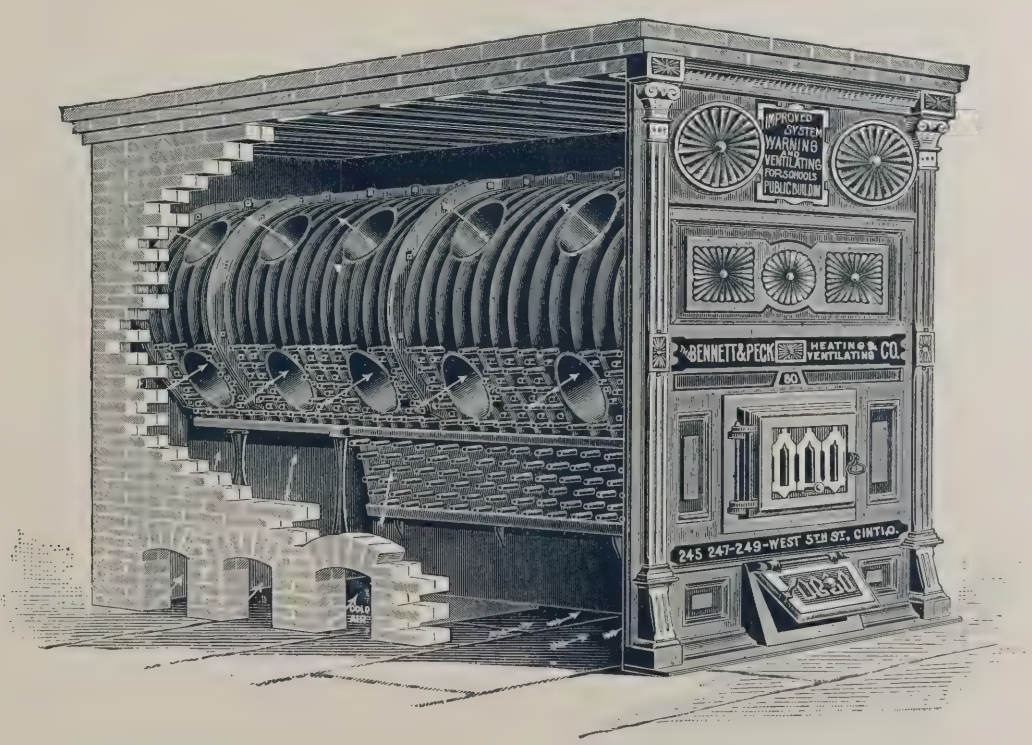
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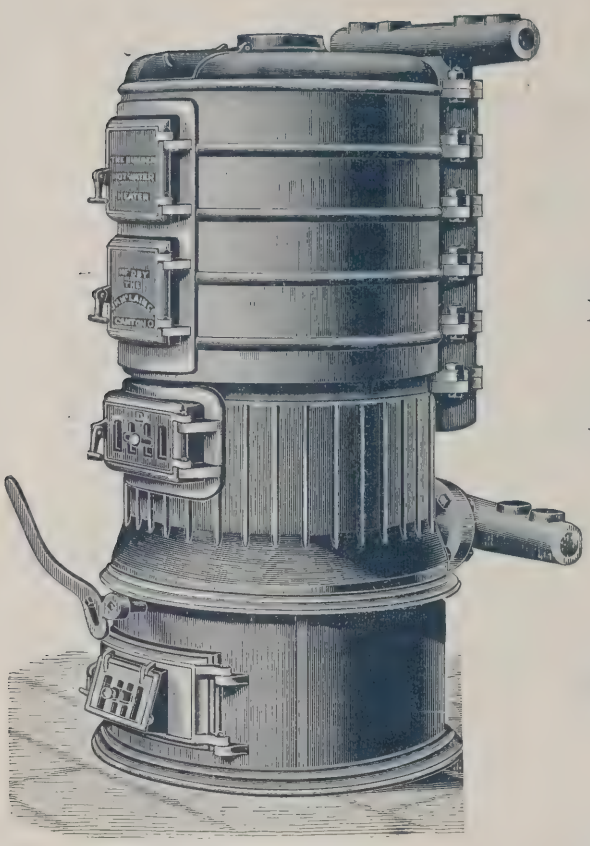
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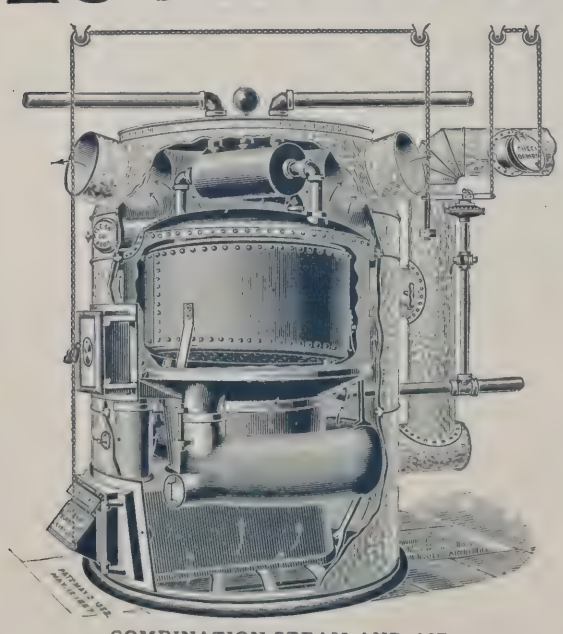
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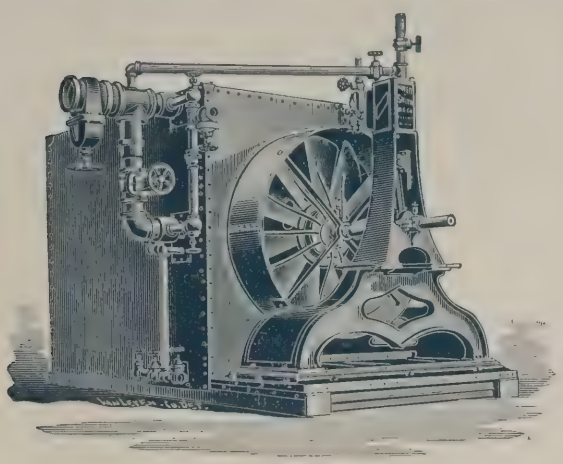
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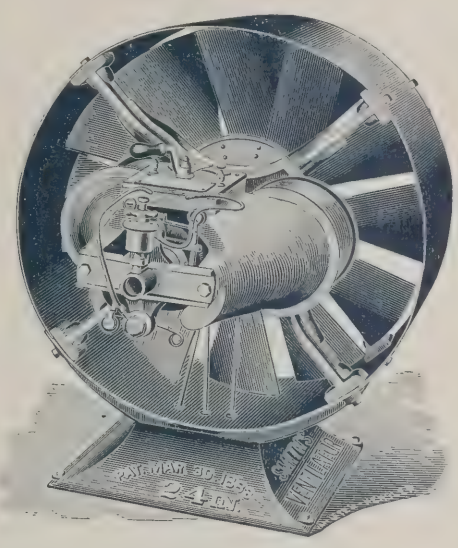
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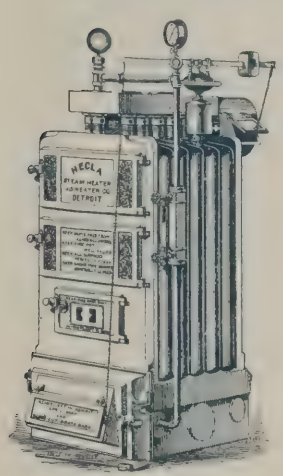


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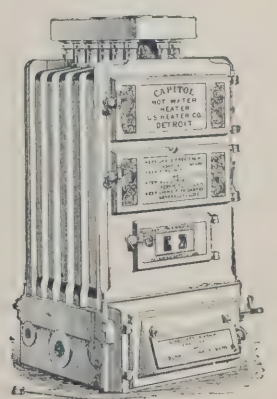
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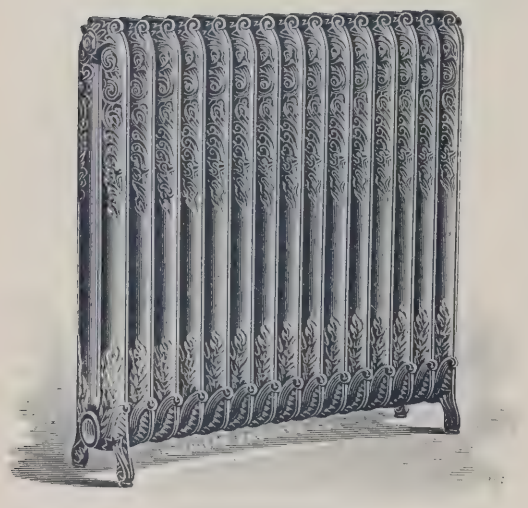
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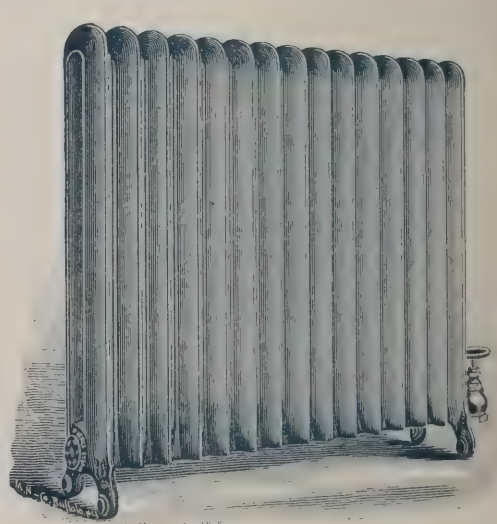
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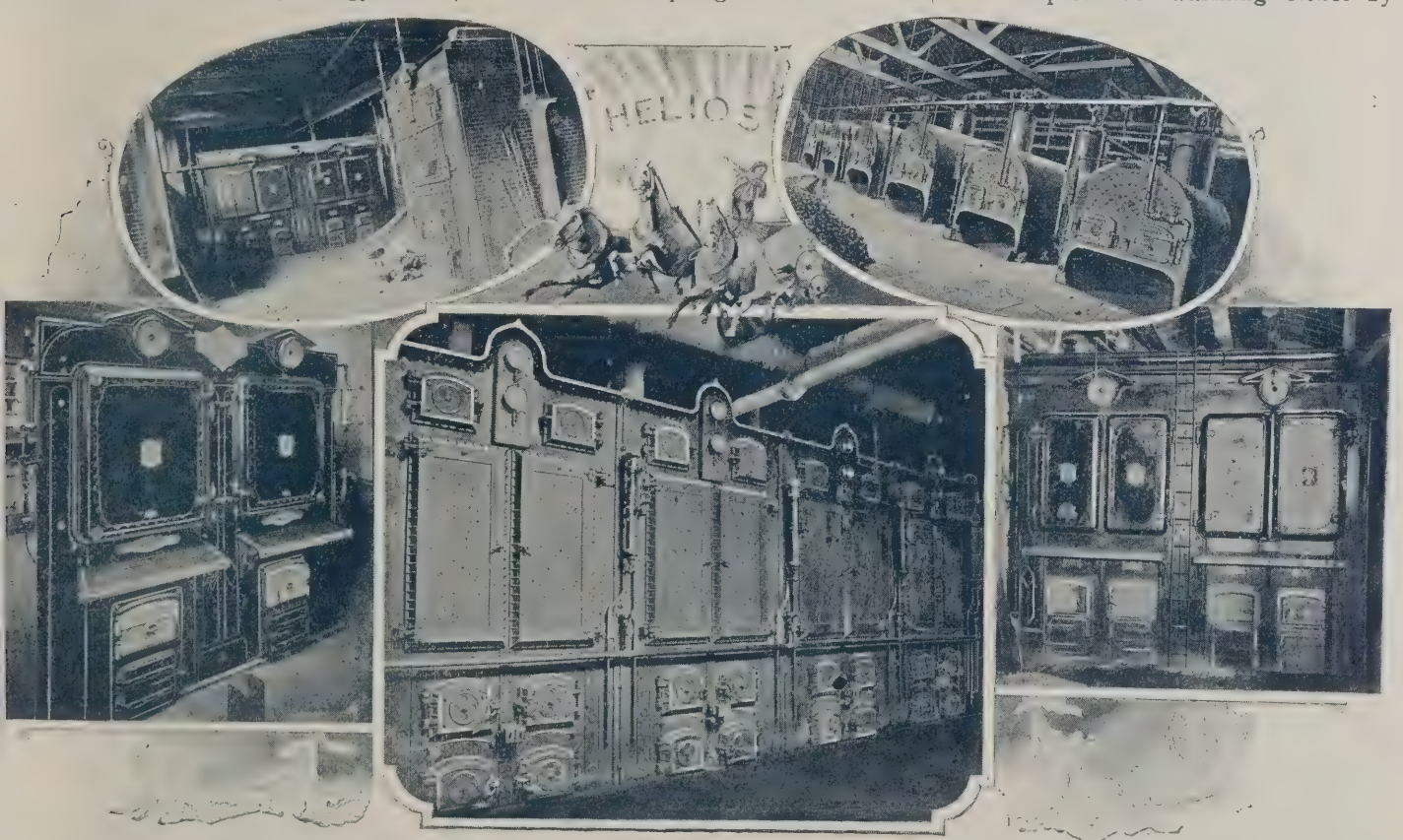
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Steam and Hot Water Boilers.

The sun was regarded by the ancients as the source of warmth and power, and was revered by them as the visible cause of creative force; therefore it was natural that Helios, the sun-god of Greek mythology, pictured as driving his fiery steeds across the heavens, should become the central figure in early religions. While we do not regard the sun with the same reverence as did the ancients, we recognize the fact that it is the central source of heat. With whatever form of heat we deal, a brief analysis will show that to the sun as primal source must be attributed its origin. Coal is the most familiar form assumed by the stored-up energy of the sun,—stored up, perhaps centuries before the sun-god myth of Helios took shape. To this we go for light, for power, for heat, the three agents which make modern civilization possible. To the latter of these, heat, as utilized in dwellings, factories, and other edifices, this article is devoted, or rather to the apparatus by which or through which the heat evolved by the combustion of coal is transmitted to water, namely, the boiler. Above we show five boiler plants for heating purposes on a large scale. The first, the upper panel at the left, shows the boiler plant of the House of Representatives at Washington, D. C.; the one at the right shows a large plant of internally fired boilers, used for heating the Hudson River Insane Asylum at Poughkeepsie, N. Y. The large central panel shows the boiler plant for heating purposes in the City Hall at Richmond, Va.; the lower panel at the left is the plant in use in the new Aquarium at the Battery in New York city, and the other panel is the plant used for heating the Carnegie Music Hall in the same city. The Poughkeepsie plant was installed by the Newburgh (N. Y.) Boiler Works, the Richmond plant by Broomell, Schmidt & Co., of York, Pa.; and the others are Root boilers, manufactured by the Abendroth & Root Manufacturing Company.



INSTALLATIONS OF BOILERS FOR HEATING LARGE PUBLIC BUILDINGS.

Without attempting a detailed description of these installations, which illustrate plants of the larger class, we will direct our attention to the accompanying descriptions of the principal steam and hot water boilers on the market.

The H. B. Smith Co., of Westfield, Mass., as one of the oldest firms in the heating business, having started as early as 1853, presents a very complete line of boilers to the trade. These goods will require but few words in the way of explanation. They represent constructions which long experience has demonstrated to be capable of giving good results under a wide range of conditions. The variety included in this line of boilers is large, the different styles manufactured by this firm being the Gold, Mercer, Mills, "O. K.," and Cottage boilers. The Gold boiler is manufactured in thirteen sizes, and can be used for either steam or water warming. The Mercer boiler is of the cast-iron return flue type, of portable form. It can be used for either a steam or water circulation, and is made in twelve sizes, and of a capacity of from 250 to 1,650 feet of steam radiation It is similar in many features to the Gold boiler, the points of difference being mainly in the direction of fitting it to meet the demands for a larger range of work. The Mills boiler is a type of vertical sectional cast-iron construction and adapted for warming either by steam or water. It is specially designed to meet the demand for a boiler for large work. It is made in forty-four sizes, and has a capacity of from 432 to 5,148 feet of steam radiation. The "O. K." boiler is another type of the cast-iron vertical sectional boiler, for either steam or water warming. It differs in some constructional features from the Mills boiler, but in the main would be used on practically the same line of work. A regenerator pipe by which, when used for steam, the steam is conducted back from the boiler drum over the fire and thus thoroughly dried, is a feature of this boiler, which is made.

in forty-five sizes, and has a capacity of from 400 to 4,000 feet of radiation. The Cottage boiler is the latest production of this company, and was placed on the market something over a year ago.

GURNEY STEAM AND HOT WATER HEATERS.

Fig. 1 illustrates the Gurney style A double crown hot water heater, which the Gurney Hot Water Heater Co., 163 Franklin street, Boston, Mass., have recently added to their already well-known line of hot water heaters and radiators. Previously they had only made two styles of this particular type of hot water heater, viz., style B and style C. Style A differs from style B and C in some few particulars. It is made with a shell base and diving flue, having both direct and indirect draft. The fire is at the top of the

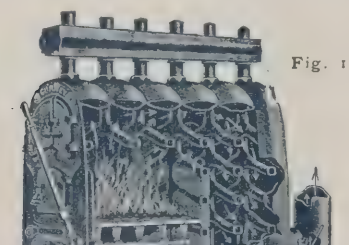


Fig. 1.

heater, as in the two former styles, and comes in contact with large heating surfaces directly over the fire. The general idea applied to their style B and style C, with which the trade are very familiar, is carried out in this heater, which is made in three sizes. The Gurney steam heater, shown in Fig. 2, is a direct surface burner, it being claimed that the fire surfaces are so effective and extensive, in proportion to the grate surface, and so staggered, that there is not left in the gases after passing over the surfaces, more heat than there should be to operate successfully in an ordinary chimney. The body of the boiler

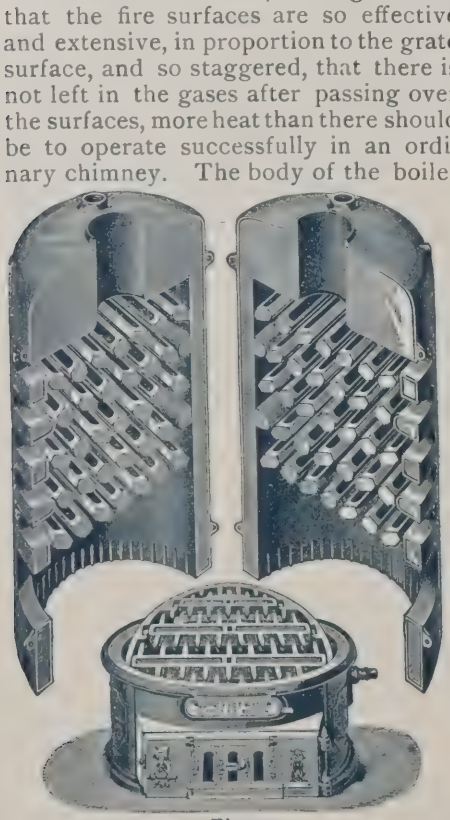


Fig. 2.

is in two pieces, and there are no water or steam joints that require packing, the joints being in every instance screwed joints or iron to iron.

THE SUN HEATER.

Fig. 1 is a sectional cut of the Sun steam heater. The direction of the heat, after leaving the heat controlling chamber, is shown by the arrows. The arms of the draft controller are shown as meeting the angle iron riveted to the shell of the heater. This position closes the direct passage to the flue and makes the heater down draft. Hand hole plates on top of the heater and

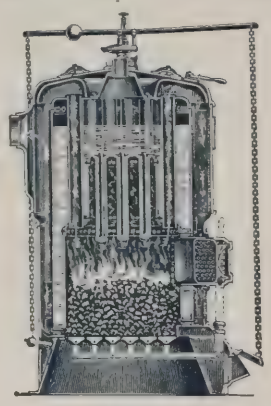


Fig. 1.

on the flange at the bottom are provided for cleaning purposes. The heating surface and steam space are ample, and the manner of taking steam out of the heater is such as to prevent siphoning of the water. Fig. 2 shows the Sun hot water heater, which differs from the steam heater principally in the distance from top of gas chamber heads, into which the drop tubes are screwed, to the outlet of heater, being

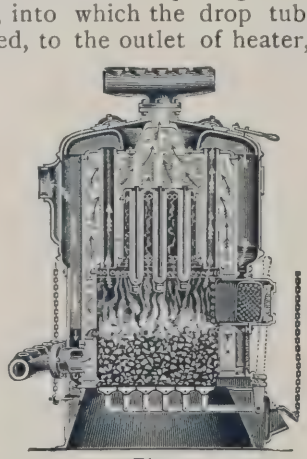
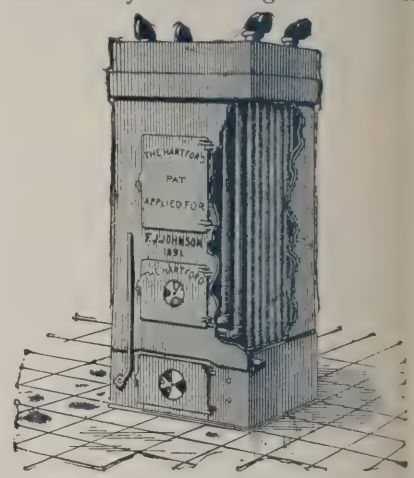


Fig. 2.

about one-third that in the steam heater. The outlet, as shown in the cut, is bell shaped, permitting the free flow of water into the pipe system. The vertical position of the heating surface is very favorable for the free and unimpeded circulation of the water. Raymond & Campbell Mfg. Co., Middletown, Pa., are the manufacturers.

HARTFORD HOT WATER HEATER.

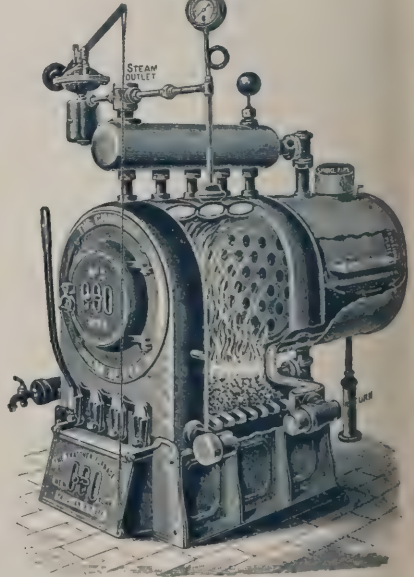
A sectional view of this heater is shown in the accompanying cut. The heater is made of wrought iron pipes placed in a vertical position, or in what is known as the drop tube system. The heating surface of the boiler is arranged directly over and around the fire, so that all parts are exposed alike. Another feature is the construction of the grate, which is a departure from the customary forms of rocking and dumping grates, in that the inventor has combined with both a water tube grate, made of heavy wrought iron pipe, which is connected to the bottom of the boiler and forms a part of it. Any part of the grate can be taken out and replaced, and the entire grate can be readily removed. When set up the boiler is cased with heavy cast iron plates firmly bolted together. These



are covered with asbestos cement to the depth of one inch, and a heavy galvanized iron jacket is put on outside of all except the front, which is cast iron. The heater is manufactured by F. J. Johnson, 84 Hudson street, Hartford, Conn.

CHAMPION HEATER.

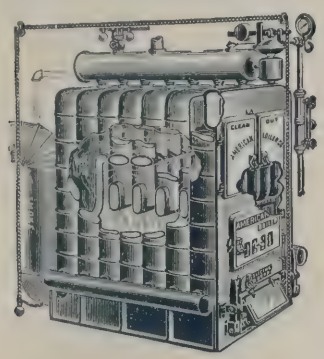
The heater shown by the accompanying cut consists of a combination of cast iron sections with a horizontal tubular return flue boiler. The cast iron sections are connected by nipples, with return headers at each side near the bottom and a flow header at the top of the heater, a horizontal tubular section connecting with the back cast iron section at the bottom and the flow header at the top. The back cast section is solid across the bottom, having a circular opening above, which permits a free entrance of the gases to the tubes in the horizontal section. This is inclosed in a shell in which flue plates are so arranged as to give a direct draft or effect a passage down and to the front of the division plate, thus reaching all of the surface of the boiler as the gases escape to the chimney. The grate, ash pit, and feed doors are ample in size and all joints are outside of the heater



readily accessible in case of leaks. The heater is manufactured, for both hot water and steam, by the Thatcher Furnace Co., 33 Peck slip, New York.

AMERICAN SECTIONAL BOILER.

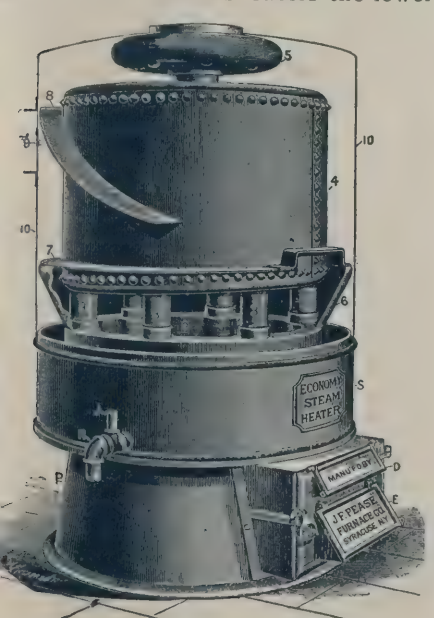
The sectional steam boiler shown in the accompanying cut is constructed on the "drop-flue" principle, with 70 per cent direct self-cleaning fire surface



and 30 per cent flue surface, arranged in a horizontal flue above the fire surface and back of the bridge wall, with an average of one square foot of grate area to 26 square feet of boiler surface. The boiler is provided with a large combustion chamber and large free water and steam passages. All connections are made with screwed joints, none of which are exposed to the action of the fire. The American Boiler Co., of Chicago and New York, are the manufacturers.

THE ECONOMY STEAM HEATER.

The heater shown in the accompanying illustration has a steel tubular boiler 4, connected to the fire pot 2, screwed into enlargements in the top of the pot, which rests on the ash pit *P* in such a way as to give ample draft around the inside of the pot. Any external radiation of heat from the pot is prevented by the outside iron skirt or casing *S*. The products of combustion pass up through the flues of the boiler, being prevented from passing up the sides by the cut-off skirts 6 and 7, thence down the outside of the boiler, being deflected toward the front by the shields 8, on each side, and then between the deflectors and skirt up to the smoke outlet 9. The water of condensation from radiators enters the lower



part of the hollow pot through the return connection *R*. This heater is manufactured by the J. F. Pease Furnace Co., Syracuse, N. Y.

THE GORTON BOILER.

The Gorton & Lidgerwood Co., 96 Liberty street, New York, manufacture boilers for both steam and hot water heating. The steam boiler, Fig. 1, consists of a main tubular part above the fire, surrounded by an asbestos lined jacket, and a water leg surrounding the fire and connected to the upper part by circulation pipes. An annular reservoir between the lower outer sur-

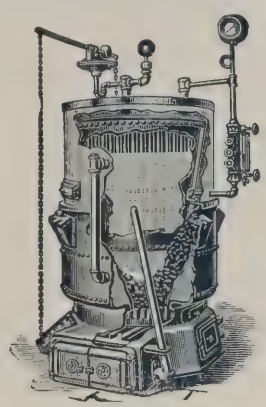


Fig. 1.

face of the boiler and the upper part of the water leg holds 12 to 24 hours' coal supply, which it distributes over the grate in such a way as to give perfect combustion. The flues, which extend from the crown sheet to the smoke dome, and are easily cleaned, are as numerous as proper circulation will admit, subdividing the water space and giving ample heating surface. The Gorton hot water boiler, Fig. 2, is built

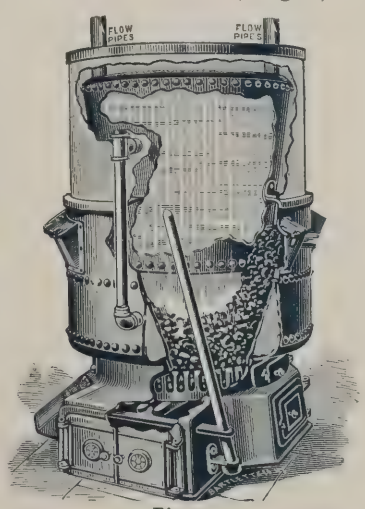
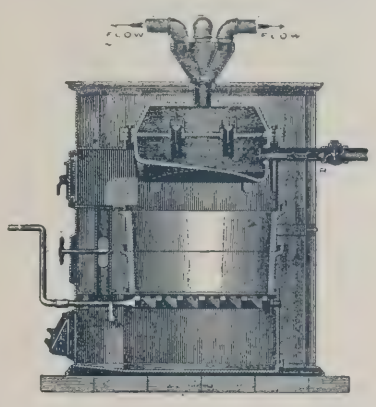


Fig. 2.

on the same general lines as the steam boiler. The returns enter at the back above the crown sheet, and as it is heated passes directly up to the flow pipes. All boilers have patent base, and upright lever for shaking the grate, also a swing pocket which makes it easy to clean the fire.

CASWELL HOT WATER HEATER.

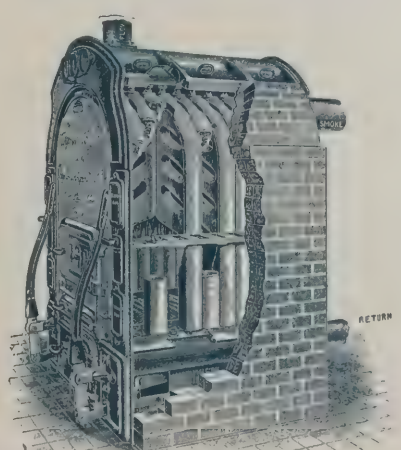
This apparatus, shown in the accompanying cut, consists of a circulator, placed over the fire in a portable setting, which is divided into two chambers by a diaphragm. Connecting these chambers are four tubes, closed at the top by small check valves. The upper chamber is connected with pipes leading to the radiators and expansion tank, while to the lower are connected the return pipes. Between the return pipe and the lower chamber a check valve is inserted, allowing the water to enter the chamber only. The manufacturers state that, "as the water in the lower chamber is heated, a slight steam pressure is formed between the surface of the water and bottom of the diaphragm. When the total pressure on the water reaches an amount equal to the weight of the vertical column of water in the risers, plus the frictional resistance to circulation, action similar to that in the cylinder of a steam engine takes place, the water line being depressed and the water forced up to the radiators As soon as the pressure in the lower chamber is relieved by the flow of the hot water, the cold water from the return lifts the check valve and enters the circulator. The steam is instantly condensed, thus forming a powerful vacuum, which draws the cold water back from the radiators to be reheated and redistributed. The Caswell hot



water circulator is not dependent upon gravitation alone. It is always put in on the open tank system, which insures absolute safety." This heater is made in five sizes in portable form only. It is provided with improved revolving grates, dust flue, double section cast iron fire pot, and a new delivery turret which insures an equal distribution of the water. F. K. Caswell & Co., Hartford, Conn., are the manufacturers.

THE HOPSON BOILER,

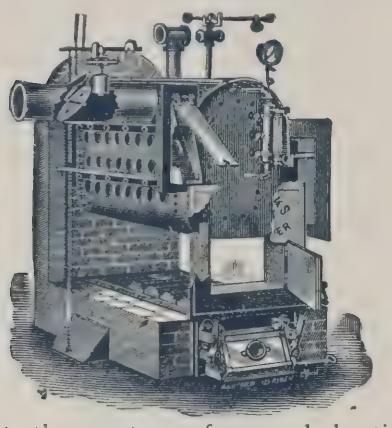
Made by the Hopson & Chapin Mfg. Co., of New London, Conn., is of the cast-iron, sectional, surface burning variety, with all screwed iron joints. The accompanying cut represents the brick-set boiler, which is provided with water front and water back and self contained base on which it is erected. Clean out plates are provided in front, rear, and along both sides at the top, so that the interior of the boiler is



readily accessible for cleaning. The return connections are flanged on bottom headers. The boiler is intended for medium to large plants.

McCORMACK'S SIDE FLUE BOILER.

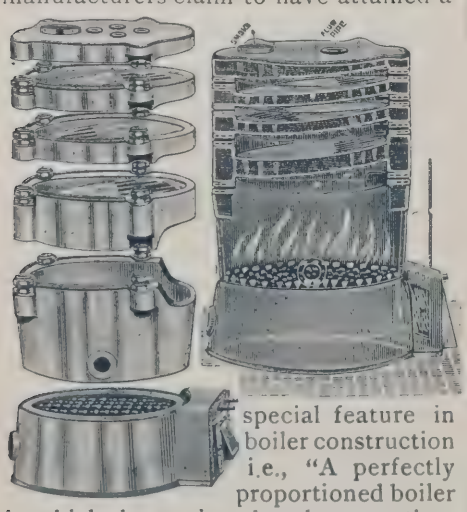
In this boiler the heated gases pass through the side flues and over the boiler top to the outlet. It will be seen that the construction and arrangement of the boiler are simple, and



that the grate surface and heating surface are ample. The flues may be easily cleaned even when there is a full head of steam, an iron door in the masonry at one side giving ready access to the flues. All the flues are below the water line, as shown. An important point about this boiler is that it may be set in a six-foot cellar without digging a pit for it. J. H. McCormack, Wallingford, Conn., is the inventor and manufacturer.

IMPROVED PALACE KING BOILER.

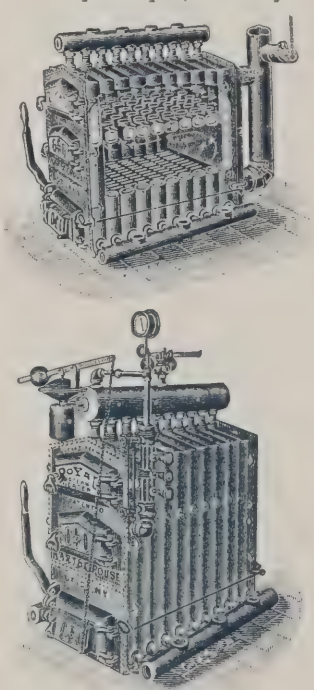
This boiler, which is manufactured by Russel Wheeler & Son, of Utica, N. Y., has a wrought iron nipple connection with running thread, the nipple being so set in the boiler that the use of it allows the retaining of the proper proportions of the boiler. The accompanying cut shows the boiler with sections suspended over each other, and nipples set in each bottom section ready to be backed out and to engage the water post of each upper section. The upper lock nut of the nipple is pinned firmly on to the nipple and acts as a shoulder for the wrench to engage, and also as lock nut. The lower lock nut runs on the nipple, and is an assurance of safety if the thread on the boiler or nipple should be damaged any way in shipment. By staggering the pockets in which the nipples set, the manufacturers claim to have attained a



special feature in boiler construction i.e., "A perfectly proportioned boiler in which the sections lay close together, and in which the flue spaces between boiler sections are not excessive, as in the case of constructions where the sections are raised considerably one from the other to allow of nipple being placed in position." The water legs in each section are deep and narrow, holding a very small quantity of water and a very large amount of boiler surface, which is all positive, as the fuel products are compelled to pass over all of it. The cut also shows their new triangular shaking and rocking grate, which is so arranged that one or more grate bars can be removed at will without disturbing the rest of the grate.

THE ROYAL HEATERS.

Fig. 1 is a perspective view of the No. 10 Royal hot-water heater, composed of ten vertical water sections, each section forming its part of the ash pit, as well as fire box and heating surface. The general internal arrangement and the circulation of gases are also shown. Large doors on front and smoke collars on rear of boiler afford easy access for brushing soot from vertical waterways. Fig. 2 shows the Royal steam heating boiler, which is constructed on the "drop flue" principle, thereby holding

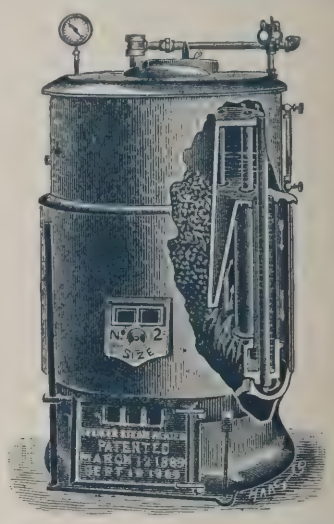


FIGS. 1 AND 2.

the gases and products of combustion in check until the largest possible amount of heat is extracted from them. The circulation of water is vertical and delivery of steam is free. The Royal heaters are fitted with triangular rocking grates that are all operated with one motion of the upright shaker bar. Each grate bar can be removed independently of the other, without disturbing any other part of the heater. The bases of the heaters are fitted with dust dampers that open directly to the back flue. The water sections extend to the base of the heater, and connections to headers are made with nipples threaded long on one end, and the joint is made tight with asbestos packing. Hart & Crouse, Utica, N. Y., are the manufacturers.

SPENCER STEAM AND HOT WATER HEATER.

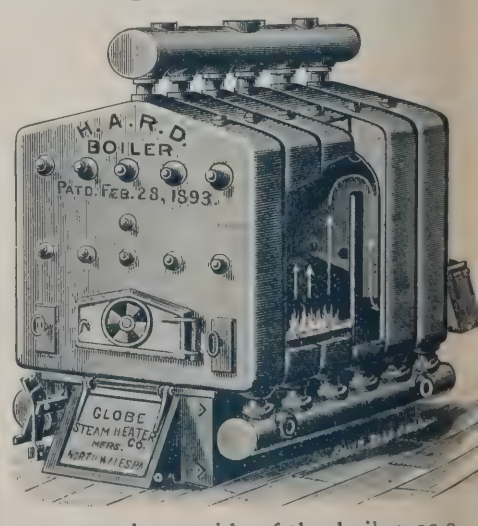
In the engraving this heater (made by the Spencer Heater Co. of Thompson, Pa.) is shown partly in section. It has magazine feed, automatic regulator, conical grate, and expanded joints, such as are used in high pressure work. The coal magazine is surrounded by water and steam, preventing its burning out or the generation of gas, besides furnishing additional heating



surface. The water connections are all vertical, giving good circulation and insuring rapid generation and liberation of steam. The grate is conical and sectional. The tubes and flues are of the best boiler tubing. The water spaces below the crown sheet are small, while above they are large, giving quick response to the fire and an even water level. The jackets are double, to prevent excessive radiation. The soot ring at the bottom is easily cleaned. As all the water of condensation is returned to the boiler, but little additional feed water is required.

THE DIETRICH BOILER.

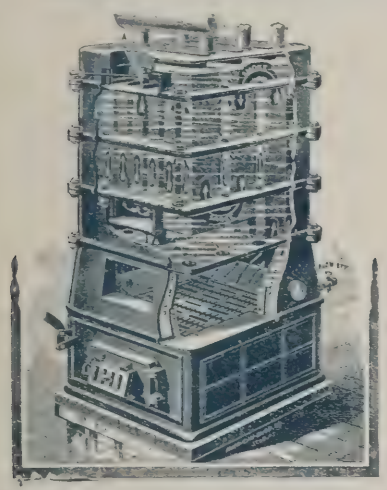
The accompanying illustration shows a cast-iron vertical sectional boiler, invented by H. A. R. Dietrich, So. Bethlehem, Pa., which is adapted alike for steam or for hot water heating. The sections are connected by means of drums and long threaded nipples, and are so designed as to secure a vertical circulation on each side of the fire box. All the fire surfaces are either vertical or overhanging, thus securing a clean fire surface to transmit the energy of the heated gases. The boiler is fitted with a good shaking grate, and is adapted for building in with a brick chamber so



as to use the outside of the boiler as a heat radiator, or it can be erected without casing of any kind. The Globe Steam Heater Co., North Wales, Pa. are the manufacturers.

THE BOYCE STEAM AND HOT WATER HEATER,

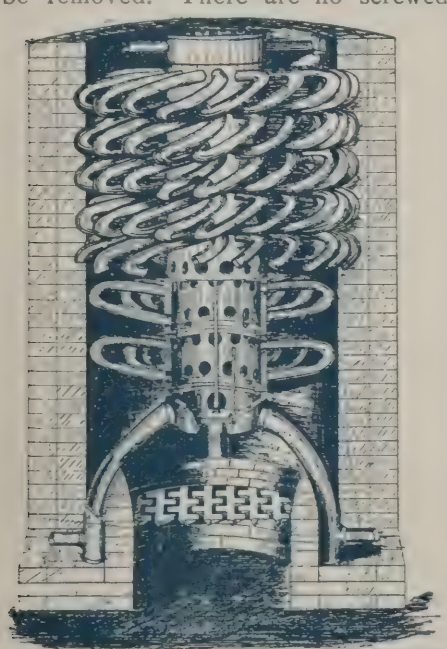
Manufactured by A. Boyce, 4512 Easton avenue, St. Louis, Mo., is shown in the accompanying partial interior and partial exterior view, the circulation of the water and the course of the heated gases being indicated by the arrows. It will be seen that while the heating surface is large, every available inch of heating surface being utilized, the grate surface, fire space, and combustion chamber are also large. In the matter of construction much attention has been given to simplicity combined with strength of parts and efficiency.



The steam heaters are made in sizes to supply from 350 to 1,800 square feet of direct radiation; and the hot water heaters in sizes to supply from 450 to 2,800 square feet of direct radiation.

THE CRANE BOILER

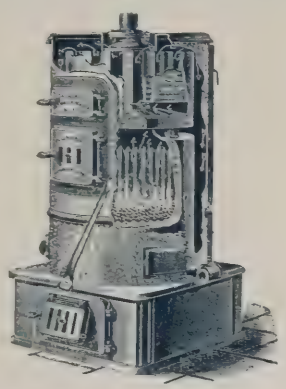
Is made up of cast or wrought iron sections having two rows of holes, into which the boiler tubes are expanded. The sections are made duplicate, and are bolted together (with a gasket between sections) with short bolts and with one or more long ones which act as braces. The column rests centrally on three water legs, into which all sediment gravitates, whence it can readily be removed. There are no screwed



joints in this heater, the invention of George A. Crane, 180 Luther street, Cleveland, O. It is manufactured by the Horse Shoe Boiler Co., same city.

THE CATARACT HOT WATER HEATER.

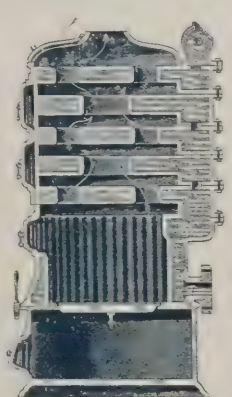
This heater (made by W. C. Mowry, Norwich, Conn.) consists of a cast iron hollow fire pot, corrugated on both fire



and water side, so as to increase the heating surface. To this is joined by nipples a crown sheet consisting of V-shaped radial arms, connecting with an 8-inch opening in the center. To the crown sheet is connected a water chamber or dome, like a gear wheel with hollow teeth, to increase the surface. This construction gives a large fire surface in small space, flue surfaces of sufficient area to utilize all available heat, and such distribution and form of water-ways as to facilitate circulation.

HUMBER HOT WATER HEATER.

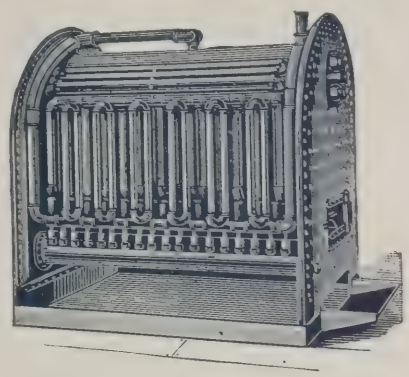
In the construction of this heater the manufacturers state that their aim has



been to secure complete combustion in the fire chamber and to interfere as little as possible with the natural flow of water. The fire pot is corrugated on the inside down to the grate, which is beveled on the lower edge so as to prevent the accumulation of ashes and to give a space for air to ascend the sides, thus securing better combustion of the fuel. The grate is both oscillating and dumping, heavy and durable. Its connections are below the fire, and fastened with nut and spring cotter. The sections are so arranged as to thoroughly mix the water and prevent ebullition. The J. H. McLain Co., Canton, O., are the manufacturers.

THE FINLAYSON STEAM BOILER.

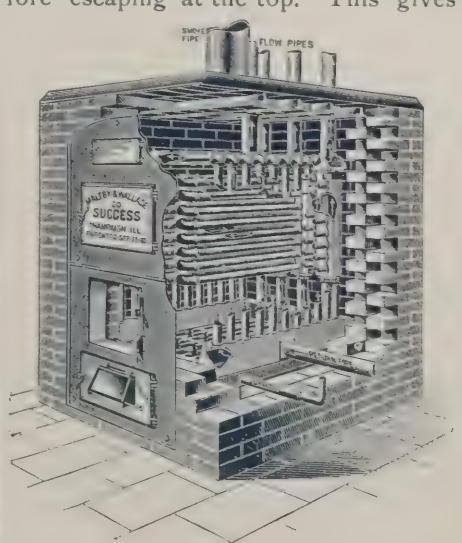
The boiler shown in the accompanying illustration is of the water tube variety, having a vertical circulation. Virtually it is a drop-tube boiler, but without its objections, having the ends of the tubes connected and arranged in sections, each section being connected at the bottom with a side flow water pipe and at the top with the steam drum, and thus securing the free circulation of water and escape of steam. The boiler is provided with a water front and water back, thus reducing the weight, saving the heat which would be lost if fire brick were used, and securing a greater efficiency. The steam drum is capacious, and has lying in it along the upper inside surface a dry-pipe, perforated with holes on its upper side (being intact along the bottom), thus taking over only the dry steam. The superheating coils are two sets of upright pipes, standing along the entire length of the boiler on the sides, the lower halves lying close to the fire. The feed water coils lie horizontally above the perpendicular steam generating pipes and utilize all the heat not taken up by the latter. For use as a house heater the boiler is readily convertible into a hot-water circulator.



The Finlayson Boiler Co., Detroit, Mich., are the manufacturers.

THE SUCCESS HEATER,

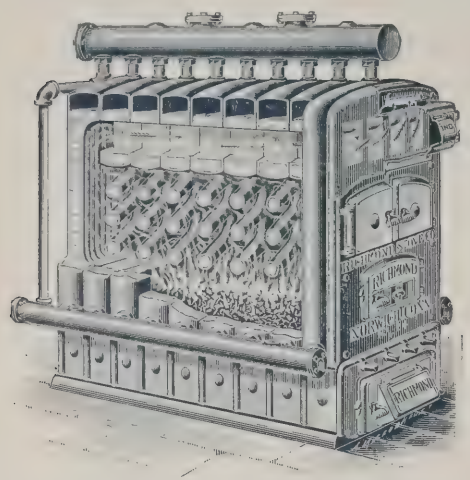
Manufactured by the Maltby & Wallace Co. of Champaign, Ill., is shown in the accompanying broken view with part of the brickwork removed. The back headers are hollow castings with partitions from end to end. Into these the pipes are screwed, one row on each side of the partition, the opposite ends being connected by return bends, and the pipes being staggered, so as to insure thorough contact with the gases. At the sides and top are pipes leading to a middle casting, which absorb still more of the heat. The return water enters the base, a portion passing to the back headers through the pipe at the bottom, whence it passes back and forth through the circulating pipes before escaping at the top. This gives



free circulation, always upward, without conflicting currents. These heaters are built in five sizes with single and four with double fire pots.

RICHMOND SECTIONAL HEATER.

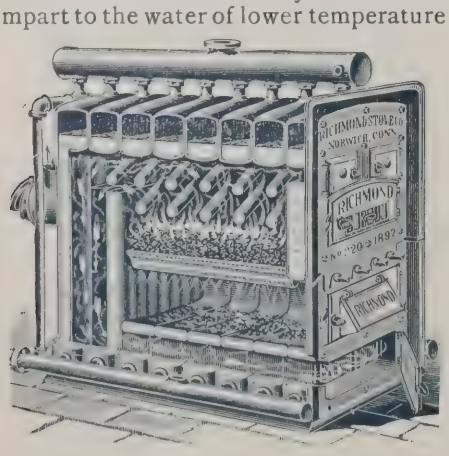
The heater shown in the accompanying cut is designed for use with either steam or hot water. The gases of combustion, rising to the top or crown



sheet, encircling the arms or waterways within the fire chamber, pass to the rear, and in the four flues shown to the front of the heater, and thence upward to the chimney. It will be seen that the heater has an extensive fire surface within the combustion chamber, while at the same time the waterways are practically vertical. Each section of the heater is independent of the other, being connected, when assembled, by nipples at the dome, and return drums at the sides through which the necessary circulation is established The large ash pit provided is formed integral with the heater, and the grate is of the triangular pattern. The Richmond Stove Co., Norwich, Conn., are the manufacturers. They make the Victor steam and hot water heaters in addition to the one described.

RICHMOND HOT WATER HEATER.

In this heater the gases of combustion, rising to the top or crown sheet, encircling the arms or waterways within the fire chamber, pass to the rear, and in two flues—one on each side—to the base of the heater, thence forward in the horizontal flues to the front, where they unite into one and return to the back, and thence upward to the chimney. Thus the heated gases, giving forth their greatest amount of heat at the top of the heater, and becoming reduced in temperature, descend and on their way to the exit impart to the water of lower temperature

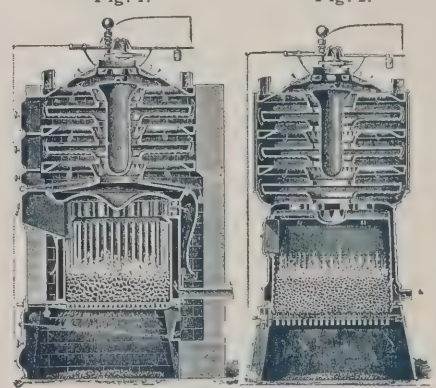


all that is practicable of the remainder. These flues are large, and it is claimed will carry the products of combustion through the heater in combined form, thus utilizing the full value of the fuel. It will be noticed that the ash pit is formed integral with the heater, and that all the flue surfaces are surrounded by the water. This heater is manufactured by the Richmond Stove Co., Norwich, Conn.

THE ALL RIGHT AND VOLUNTEER HEATERS.

Fig. 1 is a sectional view of the All Right hot water heater, which is also manufactured for steam heating. The heater is of cast iron, with a deep ash pit and a large and high fire-pot, upon the inner surface of which projections are cast to keep the water from chilling the fire. Fig. 2 shows the internal construction of the Volunteer heater for hot water. This heater is also made for steam heating. All above the fire-pot is the same as the All Right for hot water. These heaters are made

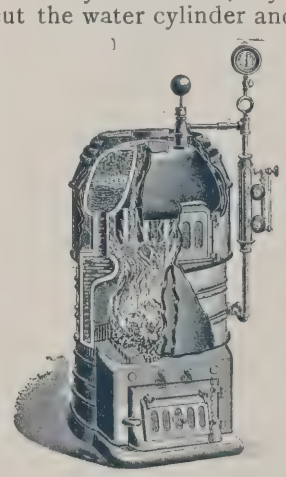
Fig. 1. Fig. 2.



in various sizes, and for large work. The manufacturers, the Wm. H. Page Boiler Co., Norwich, Conn., make a sectional boiler especially adapted for high or low steam or hot water heating.

CYCLONE STEAM HEATER.

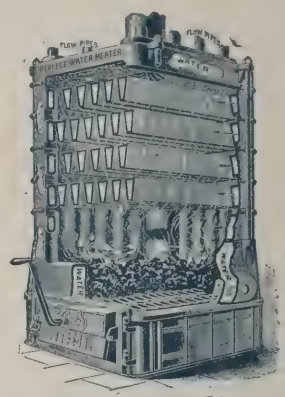
As shown by the accompanying sectional cut the water cylinder and steam



dome are connected by a series of heavy wrought iron vertical tubes, which are firmly screwed into the cylinder and dome. By this construction a rapid vertical circulation is secured, the water being brought into contact with the fire in small columns and thin sheets. The section just above the grate that the boiler sets on is lined with fire brick, and the ash-pit is large so that it cannot be choked up with ashes unless neglected. The heater is fitted with triangular revolving grates, and has all accessories necessary to safety and completeness. No brick work is necessary in setting it up, all that is required being to place and level the base when it is ready to connect. The Richardson & Morgan Co., 92 Beekman street, New York, are the manufacturers.

"PERFECT" HOT WATER HEATER.

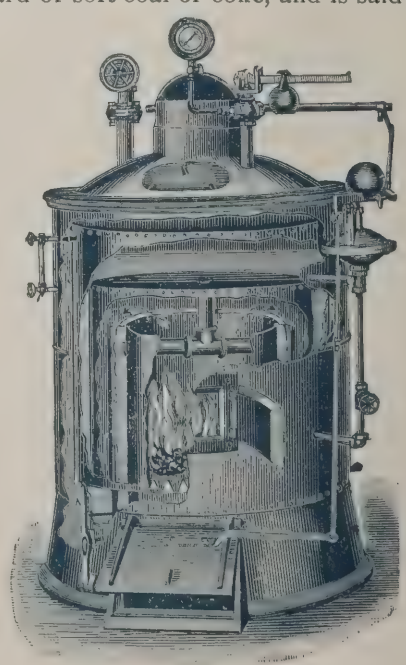
Hard or soft coal or natural gas may be used in this boiler, which is made by the American Boiler Co. of New York and Chicago. It is claimed that



85 per cent of the boiler surface is exposed to the direct action of the fire, only 15 per cent being flue surface. It is portable, and requires no brick-work. It has very few joints, and the fire surface is self-cleaning. As the water passes through every section on its way from the return to the flow pipe, a rapid and thorough circulation is assured.

THE PEERLESS

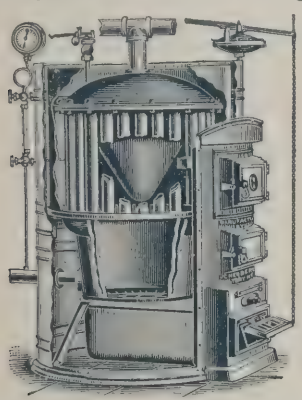
Is a steel boiler equally well adapted for steam or hot water heating. The boiler proper is directly over the fire box and has extensions projecting downward and surrounding the fire box, giving increased heating surface. Across the top of the fire box, connecting its water space with the boiler proper, is an inverted tee pipe, as shown in the cut, and short transverse pipes connect the lower portion of the boiler extension with the water space, giving good circulation through all parts of the boiler. The heated gases pass from the fire pot down around the extension, and thence upward and over the top of the boiler to the chimney, thus coming into contact with all parts of the boiler. It is made of the best quality of flange steel and iron, burns hard or soft coal or coke, and is said to



raise steam in ten minutes after lighting the fire. It is made in five sizes, by Geo. H. Bell & Co., 114 Nassau street New York.

HENDERSON STEAM OR HOT WATER BOILER.

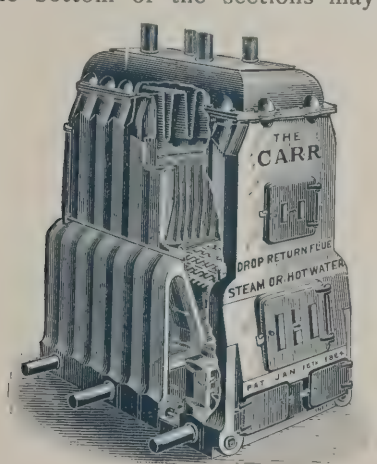
As may be seen by inspection of the accompanying cut, most of the heating surfaces of this boiler are so situated that they receive radiant heat direct from the burning fuel. The returns and feed water enter the water space which forms the casing surrounding the fire space, pass upward through the vertical tubes surrounding the combustion chamber, and discharge into the conical steam and water space at the top, from which the steam or hot water is taken through the connection shown. These boilers are provided with an automatic damper regulator, a steam gauge, and a safety valve. They are manufactured by J. C. Henderson & Co., Troy, N. Y, in sizes ranging in



capacity from 20,000 to 100,000 cubic feet of air space, warmed by direct radiation.

CARR'S SECTIONAL BOILER.

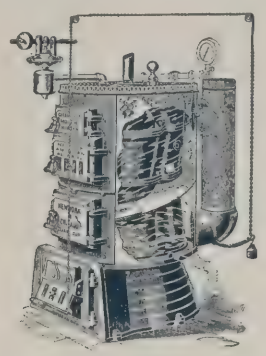
Mr. E. T. Carr, of Miles City, Montana, has recently brought out the boiler here shown. It is of the drop return tube type, the tubes being so arranged that instead of dropping at once below the ash pit they are returned on each side of the fire chamber and ash pit, by which arrangement the furnace has a low construction. It is composed of short vertical half sections connected to a horizontal top section, which forms both steam dome and crown sheet. The latter is very deeply corrugated, the corrugations being in effect drop tubes, though they possess the advantage of being easily drained. The draft may be either direct or indirect, and the water spaces are so arranged that the circulation is thorough. The bottom of the sections may be



connected through the hubs, as shown, or by means of side drums and nipples. Ample means are provided for packing, calking, etc.

THE "MODERN" PORTABLE STEAM BOILER,

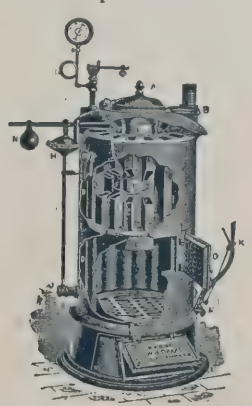
Shown herewith, and made by the American Boiler Co. (New York and Chicago), is constructed with four large



water-ways, insuring a steady water line and a good circulation. The dome is of ample capacity, to secure dry steam and to avoid any tendency to throw water into the mains. The fire pot section is deep and tapers from the bottom towards the top. It is corrugated, arched at the top, and all cast in one piece, admitting of a deep body of coal and slow combustion. The grates are triangular, easily handled, and secure a uniform combustion of gases.

TORRID STEAM HEATER.

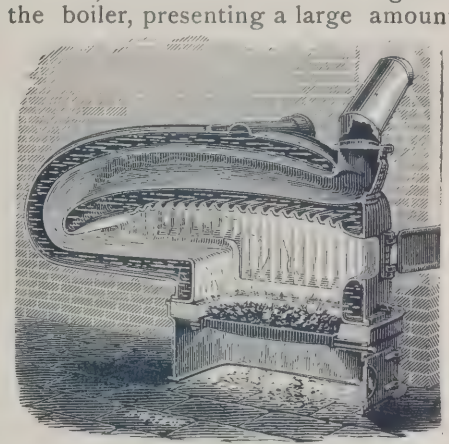
This heater, which is entirely of cast iron, is made in two sections, the lower forming the fire box, while the upper has the flues cast in one piece with the shell and the heads. The flues are upright, leaving no place for the accumulation of dust and ashes. The sections are placed one above the other, and in this position the holes through which the water and steam pass from the lower to



the upper sections are reamed and tapped, while a hydraulic nipple is firmly screwed into the openings, thus making a perfectly tight joint. The heater is fitted with rocking and dumping grate, occupies comparatively little space, and is easy to handle. The heater is adapted for steam or hot water, and is made in six sizes. All sizes are made with direct draft and return flues. In the latter the products of combustion after passing up through the tubes are carried down around the outside of the boiler, thus utilizing to the fullest extent the heat generated in the fire box. The return flue heaters may be readily converted into direct draft by turning a single damper. All sizes are made so that they can be used either with magazine, self-feed, or as surface burners. W. H. Drake, Hackettstown, N. J., is the manufacturer.

HITCHINGS HOT WATER BOILER.

The accompanying sectional cut shows one-half the fire box and flue and the water spaces surrounding them. As shown, the iron ash pit forms the base of the boiler and carries the grate and a tier of fire brick. The fire box has a low crown extension back with a slight curve downward to the opening into the flue; in length it is equal to twice that of the grate bars, in width being the same as the bars. The crown and sides are corrugated to increase the surface exposed to the direct action of the fire. The flue starts from the back of the fire box with a curve upward, returning over the top of the fire box, and extends the full length of the boiler, presenting a large amount



of surface to absorb the heat escaping from the fire chamber. The outlet from the flue opens into the smoke box, which forms the connection between the boiler flue and the smoke pipe. This boiler is made in five sizes, and is furnished with sockets at each side to receive the flow and return pipes, which may be connected to the right or left hand side as may be more convenient. It can be readily used in a low cellar, and is manufactured by Hitchings & Co., 233 Mercer steet, New York.

THE REX HOT WATER HEATER.

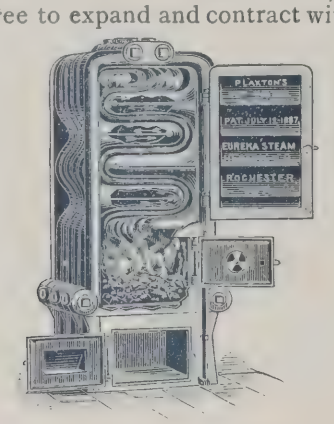
The heater shown in the accompanying sectional cut is designed for small dwellings, stores, offices, bathrooms, conservatories, poultry and brooder houses, stables, etc. As will be seen, the water chamber surrounds the fire pot and combustion chamber. The heater is provided with anti-clinker grates, and joints are done away with by making the casting in one piece. The heater is made in six sizes, the three larger being adapted to heat from



150 to 300 square feet of radiating surface, or 175 to 350 gallons of water per hour. They are made by the Rex Heating Co., 85 Centre St., New York.

PLAXTON HOT WATER HEATER.

A good idea of the construction of this heater may be gained by an inspection of the cut. It is made up of two fingered sections, as shown, alternating in such a way that the flames and gases are compelled to take a serpentine course on their way from the fire pot to the smoke pipe, giving a greatly extended heating surface. The corrugations of the sections extend down to the grate surface, so as to utilize as much as possible of the direct radiant heat of the fire. The sections are held together by bolts running through the water spaces at top and bottom. The location of outflow and return pipes are shown in the cut. As the opposite halves of each section have no rigid connection with each other, they are free to expand and contract without



danger of fracture. The Eureka Steam Heating Company of Rochester, N. Y., manufacture a full line of these heaters.

G. & J. R. BOLTON'S IMPROVED HEATER.

The Foskett & Bishop Co. of New Haven, Conn., are the manufacturers of this heater. Two cast iron water chambers, forming respectively the base and the top of the boiler, are connected by wrought iron pipes screwed into the top and connected with the base by a running thread and lock nut. In the upper chamber is a flue hole for the escape of smoke and gases. All the pipes are vertical except one row, which passes almost horizontally from back to front, forming the top of the fire pot. Above these horizontal pipes is an arrangement of drop tubes, inside of each being a circulating tube. The top, sides, and back of the fire pot are composed of thin wrought iron pipes through which there is a constant circulation of water. The gases pass up among the drop tubes, so that every



available particle of heat is taken up by the water. Any pipe of the fire surface may be removed or replaced without disturbing the setting.

WILKS HOT WATER HEATER.

This heater, made by the S. Wilks Mfg. Co., 115–123 Clinton street, Chicago, Ill., has recently been improved by the company's manager, Mr.



E. H. Sedgwick. It is constructed entirely of steel, and as the engraving shows, the circulation of the water is entirely vertical. The inner cylinder surrounding the fire box and combustion chamber is cone shaped. The flame and gases pass up between this cylinder and the magazine, in through the apertures in the upper part of the magazine (which is separated from the lower part by a lid), and out through the smoke pipe at the top. At the bottom the return pipes are connected, as shown, the outflow pipes being connected at the top. This heater is simple in construction, and being made wholly of steel plate, is very light for its capacity and strength.

MORGAN MAGAZINE BOILER.

This boiler is built up of horizontal sections, each section consisting of a



large outer annular water space and a smaller inner annular water space, the latter forming the magazine. The water spaces are connected by hollow radial arms, and in constructing the boiler the sections are so arranged that the arms of one section are immediately over the spaces between the arms of the section beneath, thus making sure of the greatest possible contact with the heated gases. After passing up between the radial arms the gases return to the bottom through openings in the outer annular water spaces, and again rise in the space between the outside and the jacket. The point is made by the manufacturers (the D. F. Morgan Boiler Co., Akron, O.) that every inch of iron exposed to water on one side is exposed to fire on the other, the fire pot being also a water space; moreover, there are no screwed joints exposed to the heated gases.

SCOLLAY'S HOT WATER BOILER.

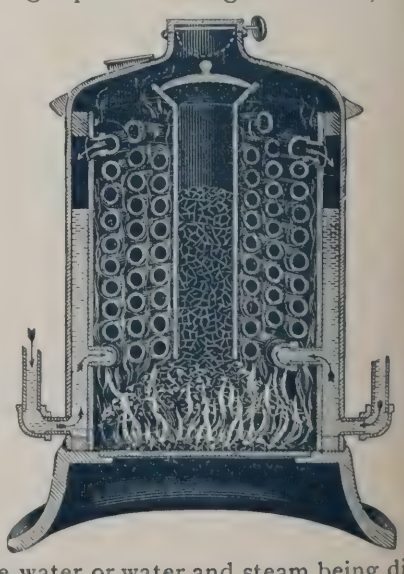
The sectional cut presented herewith shows a portable form of hot water heater manufactured by John A. Scollay, 74–76 Myrtle avenue, Brooklyn, N. Y. It consists of two shells, the space between which is occupied by water. Directly over the fire is placed a cast iron water chamber, the under surface of which is extended by circular corrugations studded with tapered projections. These projections, besides those on the sides of the water chamber, serve the double purpose of strengthening the casting and increasing the heating surface. It will be seen that the base of the heater forms the ash pit and supports the grate, the boiler proper being supported on a circular ring of iron which rests on the ash pit and which is lined with fire



brick to form the base of the fire-box. An equal distribution of heat is secured by placing the smoke outlet in the center of the top of the heater.

THE MONITOR STEAM GENERATOR

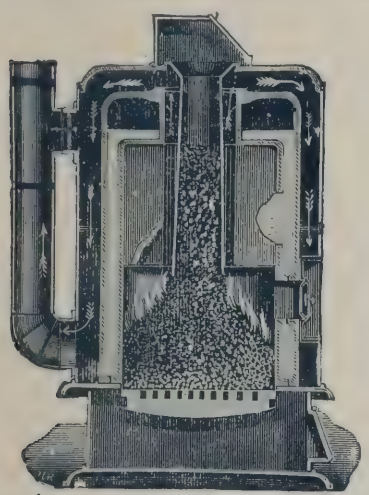
And positive hot water circulator, shown herewith in section, is made by the Monitor Steam Generator Mfg. Co. of Landisville, Pa. It consists of an outside water leg formed by a double shell of boiler steel, with a two-inch water and steam space between the shells. In the center is the fuel magazine, as shown, and between this and the water leg are three coils of extra heavy wrought iron pipe, connected to the water leg at top and bottom. The circulation is indicated by the arrows, the water entering at the bottom, circulating upward through the coils, and



the water or water and steam being discharged into the water leg at the top. The base has draft door and register, and a grate of the crusher type.

MAHONY RETURN FLUE STEAM BOILER.

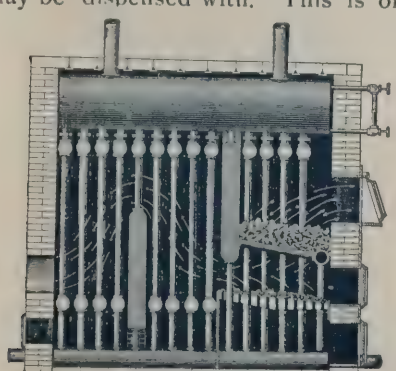
As shown in the engraving, this boiler has magazine feed. It is made of two heavy shells, a heavy corrugated cast-iron fire pot in one piece and a cast-iron exterior shell, also in one piece, the space between the two forming the water and steam space. There is also a cast-iron jacket and a magazine, as shown in the cut. In the combustion chamber above the fire pot there are very deep corrugations or radial recesses in the inner shell, extending inward to the magazine, giving a vastly increased heating surface. The gases pass up between these corrugations, through the central opening in the steam dome, outward, and down



through the space between the outer shell and the jacket to the outlet. It will thus be seen that all available heating surface is utilized. These and other types of boilers are made by M. Mahony, Troy, N. Y.

HERBERT'S DOWN DRAFT WATER TUBE BOILER

Is designed for steam and hot water heating, and for the purpose of consuming the cheaper grades of soft coal without smoke. The draft, as indicated by the arrows, is through the fresh coal on the water tube grate and back among the water tubes which constitute the main heating surface of the boiler. The lower grate is intended to catch the smaller fragments of coal that fall from the upper grate. Any unconsumed carbon from the upper grate is completely burned in passing through the intense heat radiated from the incan descent fuel on the lower grate. For hard coal, the use of the upper grate may be dispensed with. This is only



one of a series of different types of boilers, for steam and hot water heating, made by the M. E. Herbert Heater Co., 41st and Lasalle streets, Chicago.

THE SUNRAY STEAM AND WATER HEATERS,

Of which sectional views are given here are manufactured by the J. L. Mott Iron Works, 84-90 Beekman street,

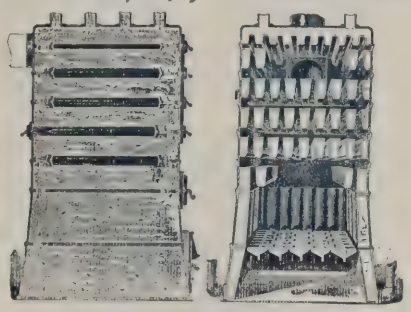


Fig. 1. Fig. 2.

New York. Fig. 1 is a sectional view from front to rear of the water heater, showing water circulation; and Fig. 2 shows the arrangement of the fire and combustion chambers. The return water enters at the bottom of the ash pit casing, passes up around the fire-pot, across the sections forming an arch over the fire-pot, and through the upper sections to the combustion chamber in the course indicated by the arrows in Fig. 1. The water passages are so arranged that they expose a very large surface to the heated gases, which pass between the tubes to the top of the heater, to the combustion chamber, where any unconsumed gases are utilized; thence they pass down the return flues, which are surrounded by water, and off to the chimney. The

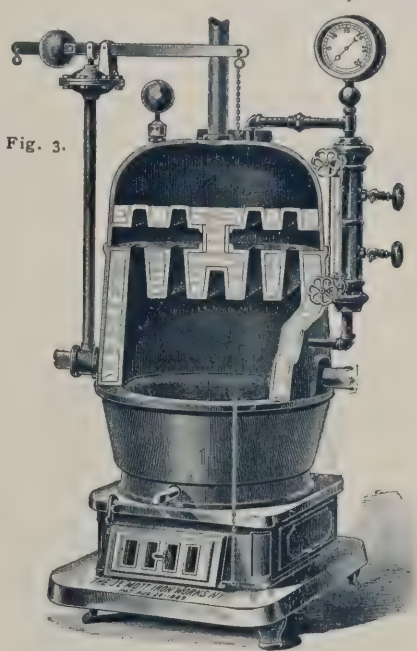
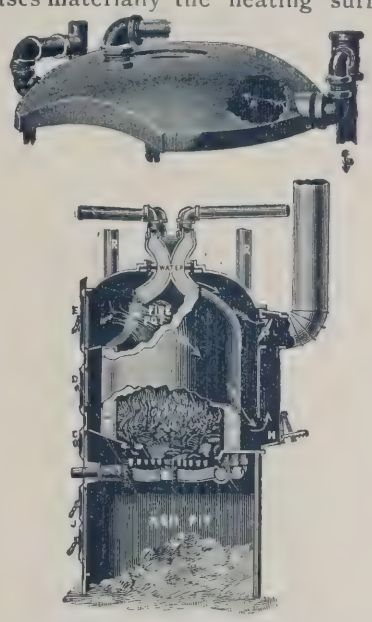


Fig. 3.

steam heater is shown in Fig. 3. It is made on the same general principles as the water heater, from which it varies but slightly in construction, being cylindrical in shape and having a steam chamber in place of the upper water space in the hot water heater.

THE THAYER HOT WATER HEATER.

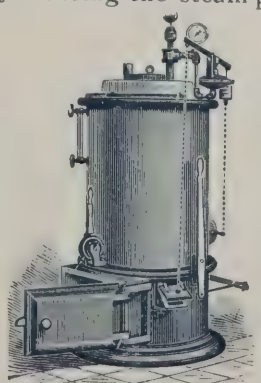
Consists of a cast iron water jacket with a dome shape top, which forms a casing for the fire box, all being cast in one piece, as shown in the cut. The water is heated while passing up between the inner and outer shell, by the radiant heat of the inner shell and by the heat absorbed by the outer shell from the gases, which are compelled to pass around it on their way to the chimney. The entire surface is accessible for cleaning, which is easily done, as there are no places for soot to lodge upon. The cast iron ash pit is made in parts, and has a simple and durable revolving grate, which prevents the lodgment of ashes at the back. The boiler is surrounded by a cast iron top and casing, which prevents radiation and makes the whole water space available as heating surface. When desired the boiler has an auxiliary water top, shown in the upper cut. This is connected with the flow and return pipes, has an independent circulation, and increases materially the heating surface



and capacity of the heater. The manufacturers are the Thayer Heater Co., 143 High street, Boston, Mass.

ROYAL STEAM AND HOT WATER HEATER.

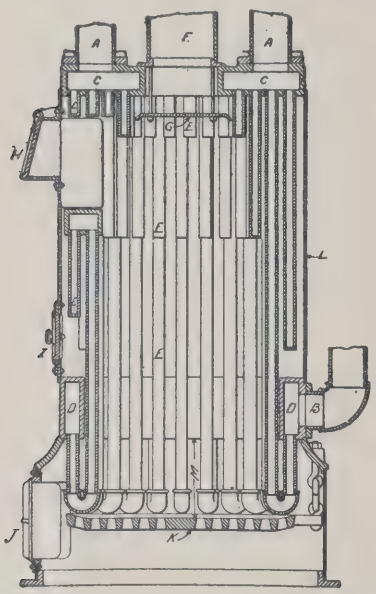
The top-feed boiler shown by the accompanying cut is constructed of steel plate, and may be used for either steam or hot water heating. The outside shell or casing has a thin water space surrounding the fire box; this is connected by extra heavy wrought iron pipes with a tank or generator directly over the fire, the pipes maintaining a circulation between the two parts. The heat strikes directly against the water-filled sides of the fire-box and the bottom of the tank, passing up through a narrow space between the two and down the outside to the flue at the bottom, giving an indirect draft. There are no tubes to become clogged or leaky, and the flues may be readily cleaned, without reducing the steam pressure,



through openings provided for that purpose in the top of the heater, which is manufactured by the Royal Steam Heater Co., Gardner, Mass.

THE WINDSOR HOT WATER HEATER

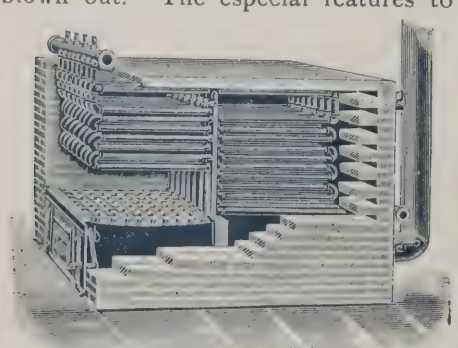
Is constructed of both cast and wrought iron in such a manner that no fire comes in contact with the cast iron part. Every joint is screwed up, iron to iron, without packing, bolts, or lock nuts. Expansion and contraction are provided for in a manner to assure durability, and all parts are easy of access. The distance between the lower annular water space and the horizontal grate is from 9 to 13 inches, so that the lower ends of the pipes of which the heater is composed may be said to be part of the grate surface besides being effective heating surface. By this construction the admission of heated air is secured in such a manner as to insure perfect combustion. The circulation of the heater is direct, the water being distributed around the



heater in the lower annular water space, from whence it is conveyed through the large number of small pipes which connect the lower with the upper annular water space. The Windsor Heater Co., Galena, Ill., are the manufacturers.

THE ELECTRIC BOILER,

Manufactured by the Electric Boiler Co., Rochester, N. Y., is a horizontal water tube boiler composed of sections which vary in number according to the required size of boiler. The sections are vertical, and connect at front and rear with flow and return headers. The shape may be varied, so that the boiler may be fitted to any desired space. All parts are accessible for cleaning, and all water ways may be thoroughly blown out. The especial features to



which the manufacturers call attention are, (1) the ease with which it may be handled, (2) the readiness with which repairs may be made by the fitter without having to send for special castings, (3) the ease with which it can be increased in size while preserving the proportion of grate and fire surface, and (4) the rapidity with which it will make steam or heat water.

WILCOX HOT WATER HEATER.

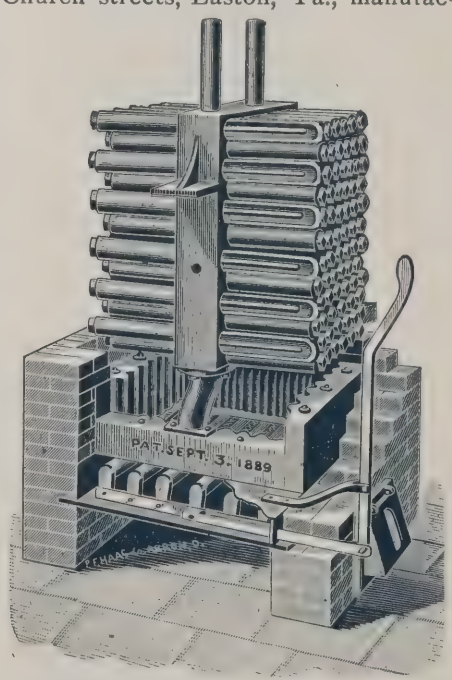
The sectional cut presented herewith shows a heater, which is circular in



shape, consisting of a sheet iron jacket, lined with non-conducting material to prevent the escape of heat. Inside of this jacket is a series of coils made of wrought iron pipes inclosed in a circular chamber or hot air flue, up through which the heat is compelled to follow the coils. The heat of the gases of combustion is absorbed by the water coils before they reach the top of the jacket, where the smoke passes into the pipe leading to the chimney. This heater is made by the Wilcox Heater Co., 297 Wabash avenue, Chicago, Ill.

THE EASTON BOILER.

Rohn & Ellicott, corner West and Church streets, Easton, Pa., manufac-



ture this boiler, which is shown here before being brick-set. The fire box is a cast iron reservoir, which receives all condensation, heating it before it enters the boiler proper. The shell and circulating tubes are so arranged that they are all directly exposed over the entire fire surface, making it an effectual heater of water or generator of steam. Each heater has a grate of entirely new design, which will not burn out and which effectually cleans the fire and grinds out the cinder without making dust. They are made in sizes to supply from 212 to 1,654 feet of radiation.

THE HECLA, CAPITOL AND MASCOT HEATERS.

The Hecla Heater, a sectional view of which is shown in Fig. 1, is a modification of the Capitol hot water heater, the same front, back, grate, and ash pit being used in both. The interior water sections have been changed, however, to adapt them to steam, Fig. 2 showing the Capitol water section and Fig. 3 the Hecla steam section. The middle water way of the Capitol has been increased in depth in the Hecla so as to give increased water space, and also to allow for the fluctuation of the water line *A B*. The water leg of the Hecla is larger than that of the Capitol, permitting of the introduction of the diaphragm *C D* which provides a circulation of water in each section. The Hecla embodies all the advantages

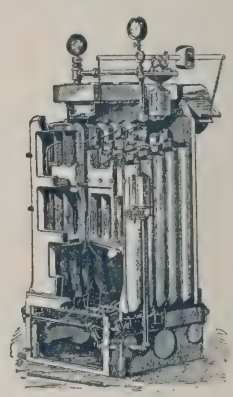


Fig. 1.

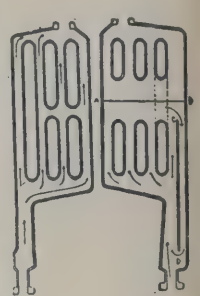


Fig. 2. Fig. 3.

of the Capitol—ease of handling, of setting, of cleaning, and of repairing; the vertical circulation and lateral draft; the all metal connections, etc. The United States Heater Co., Detroit, Mich., manufacture these heaters, and also the Mascot steam heater, Fig 4, which is designed for heating small resi-

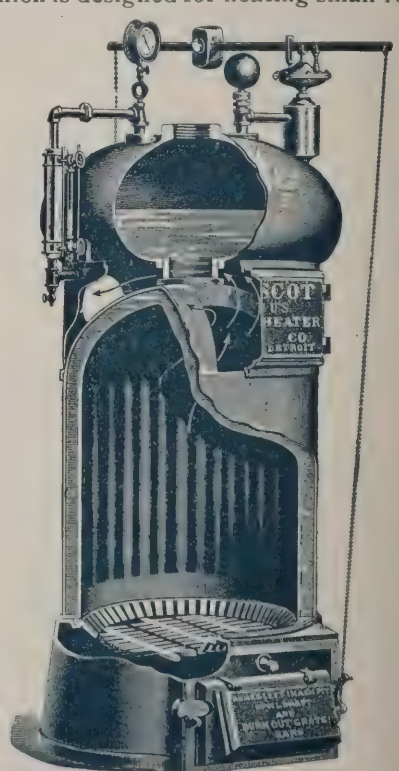
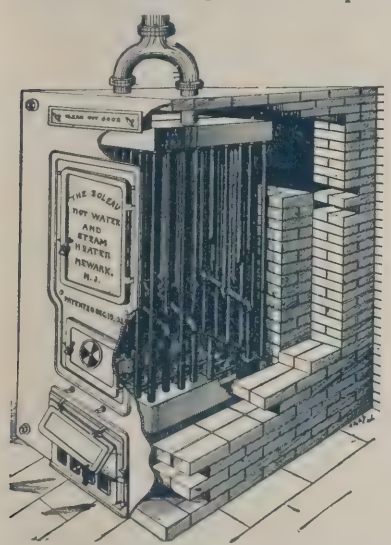


Fig. 4.

dences, flats, conservatories, greenhouses, etc., and for furnishing hot water for hotel, domestic, and other purposes.

SOLEAU STEAM AND HOT WATER HEATER.

The accompanying perspective cut illustrates the construction of the hot water heater, showing the upper and lower water sections and the connecting hot water tubes or pipes. A bridge wall at the back of the heater slightly retards the outflow of gases, the heat being compelled to pass entirely around and between the pipes and also above the upper sections. A system of inclined tubes or pipes connects with a series of vertical tubes which run to the center of the heater, thereby exposing more heating surface and causing a good circulation. The lower as well as the upper sections are made in halves, the lower sections, when in place, forming an open space for the support of a rocking grate, giving sufficient space to



form a fire-pot, above which the inclined tubes are arranged. The steam heater is similar to the hot water heater except that the upper water section is made deep for steam space and the inclined and vertical pipe increased one size larger than the drop tubes. E. R. Soleau, 247 Lincoln avenue, Newark, N. J., is the patentee and manufacturer.

EXPERT HOT WATER HEATER.

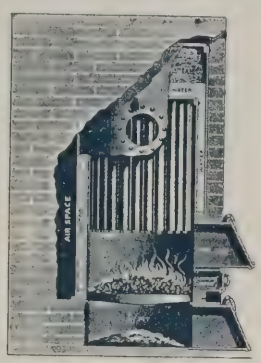
In this cast-iron sectional heater the products of combustion pass to the rear of the fire chamber, then forward through the lower pair of flues and back to the smoke outlet through the upper pair. The sections are fastened together by means of three bolts which pass through the waterways at the side near the bottom and at the top of the heater, thus preventing leakage or



reakage from unequal expansion. The ront flue door and the back casing bove the fire-brick linings are heavily ned with non-conducting material. The heater is provided with a simple, efficient shaking and dumping grate, and is made in sizes containing from three to seven sections, by Sherman S. Jewett & Co., of Buffalo, N. Y.

REMINGTON DROP TUBE HEATER.

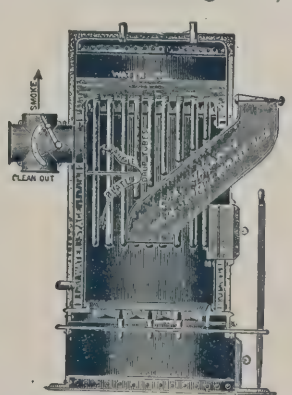
The house heater shown in the cut is made throughout of best wrought iron.



The drop tubes are screwed into the fire-box head and drop to within a few inches of the fire surface. A brass tube of about one-half the diameter is fitted inside of each drop tube to insure a constant circulation of water. The cut shows the heater set in brick work, with a hot air space around it, so that the radiating surface of the heater can be utilized to advantage to heat the hall of the house by connecting this space with a flue and running the smoke pipes to the chimney; or the space can be utilized for conducting the hot gases to the chimney, thus exposing the outer surface of the shell to the heat. The heater is also furnished with a wrought-iron casing, set on the Glenmore base, which makes a very convenient form of portable heater. The Remington Machine Co., Wilmington, Del., are the manufacturers.

THE KEYSTONE BOILER,

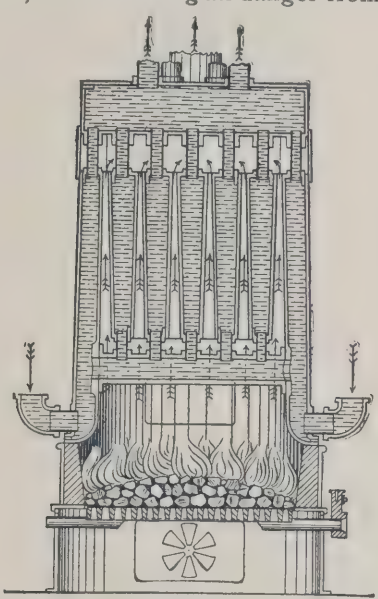
As arranged for steam heating, has a self-feeding coal magazine, and a



large fire pot entirely surrounded by a water space, as shown in the sectional view herewith. In addition to the heating surface of the fire pot, which is made of steel plates, ample additional surface is afforded by the drop tubes which extend down from the crown sheet well into the fire pot. A baffle plate extending about half way to the front of the boiler, just below the smoke outlet, forces the heated gases into contact with every part of the drop tubes and other heating surface. The improved shaking and dumping grate may be removed through the ash pit doors, and the magazine may be easily lifted out, leaving the tubes accessible for examination or cleaning. An important feature is the combined smoke elbow and damper. These boilers are also made without the magazine, its place being taken by additional tubes. Broomell, Schmidt & Co., York and Philadelphia, Pa., are the manufacturers.

NOLAN'S PATENT TUBELESS BOILER.

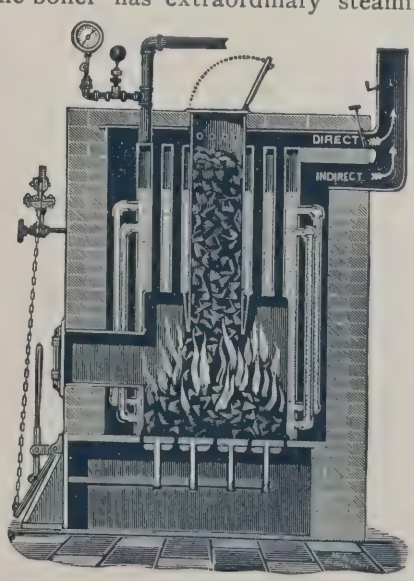
The hot-water heating boiler shown in the accompanying illustration consists of a series of hollow annular conical castings, concentrically arranged in a vertical position. The large heating surface is all direct and the form of the annular chambers insures rapid and free vertical circulation. The boiler is open to the air through the expansion tank, thus obviating all danger from ex-



plosion. It is manufactured by Wm. E. Nolan of 96 Quay street, Brooklyn, N. Y.

THE FERGUSON BOILER.

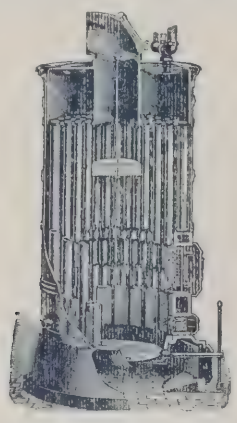
A vertical tubular boiler having the circulation tubes on the outside of the shell in the return flues, manufactured by the Ferguson Boiler Co. of Albany, N. Y., is shown in the illustration. It is intended for both hot water and steam heating, is made of steel of 60,000 pounds tensile strength, and tested to 100 pressure to the square inch before leaving the shop. It is claimed that the boiler has extraordinary steaming



capacity, due mainly to the rapid circulation induced by the circulation tubes. The boilers are made both with and without fuel reservoir.

EQUATOR STEAM BOILER.

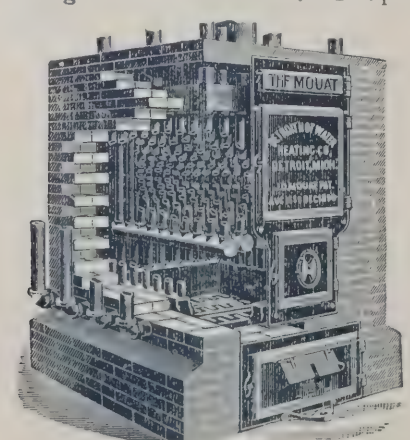
This boiler is of the drop tube type, the reservoir on top being of cast iron in the smaller sizes and of steel plates with cast iron heads in the larger sizes. Into the crown sheet are screwed a number of one-inch drop tubes, the outer row, however, being of 1½-inch tubes. In each tube is a diaphragm, insuring active circulation, the water passing down one side of the diaphragm and water and steam up the other. After passing over the tube surfaces, the gases are discharged through a central tube in the steam chamber, a fire brick baffle plate compelling them to circulate well among the tubes before going



to the chimney. Boilers of this type are made with a proportion of heating to grate surface as large as 38 to 1. Between the outer tubes at the bottom are fire bricks, made to fit the space, and keeping the fire from contact with the cooler surfaces of the pipes. This boiler, and others, are made by the Nason Mfg. Co., 71 Beekman street, New York.

THE MOUAT HEATER

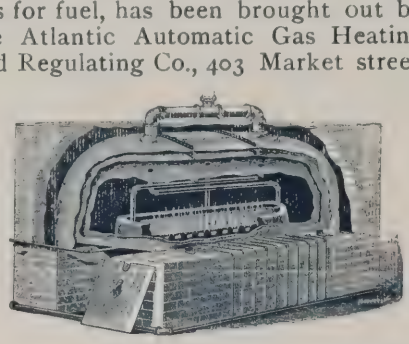
Is made entirely of wrought-iron pipe, with the exception of the headers, base, and top, which are heavy castings. Joined to the pipes at the back, which are larger than the side pipes, are the headers which form the top of the fire pot. These are connected with the top of the heater by means of wrought iron pipes. The headers are inclined downward from front to rear to secure drainage of water and collection of sediment. All pipes are vertical, the outside ones joining the base and top and the inside ones the base, headers, and top, thus securing vertical circulation. The parts



are screwed together, no bolted or flanged joints being used. The Mouat Heater Co., Detroit, Mich., are the manufacturers.

THE WARE HOT WATER HEATER.

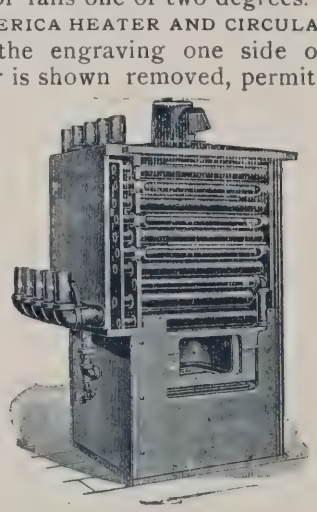
A new form of hot water heater, using gas for fuel, has been brought out by the Atlantic Automatic Gas Heating and Regulating Co., 403 Market street



Philadelphia. It consists of an outer casing *A*, and two inner shells, between which is the water space *C*. Another water space is inclosed in the shell of the fire pot *D*. The water spaces are connected by the pipes *L*. The return pipes are connected at the bottom of the water spaces, and the flow connections are shown at the top. The burners are supplied by the individual pipes *F*, connecting with the main *G*, so that any burner may be turned on or off as desired. A separate burner, arranged so as to burn continuously and ignite the main burners, is supplied with gas through pipe *E* The temperature of a house using this heater is kept at any desired point by a means of a sensitive thermostat, which regulates the flow of gas through the main by means of an electric controller, which lessens or increases the supply as the temperature rises or falls one or two degrees.

AMERICA HEATER AND CIRCULATOR.

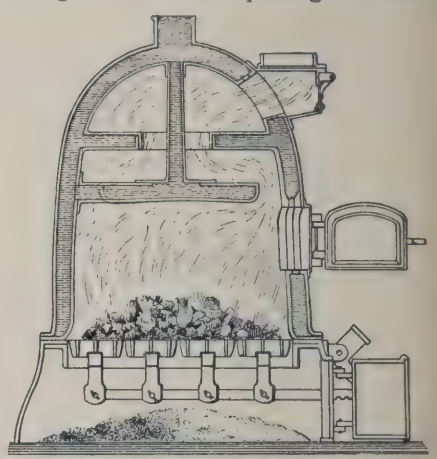
In the engraving one side of this heater is shown removed, permitting a



view of the interior. The flow pipes are connected at the top of the heater at *I*, and the return pipes connect at *A*, in the rear. The water space at the rear is divided by a partition into two parts. The returns fill the outer part, pass through the small tubes connected to the partition, and return through the larger outer tubes (which are closed at the free end) to the inner part of the water space, thoroughly heated by the absorption of heat from the gases in the combustion chamber, and pass out through the flow pipes. To insure a thorough absorption of the heat, the gases are forced to zigzag through the combustion chamber by the three baffle plates shown. The fire pot is also a water leg, receiving the returns through the connection shown at the rear, the heated water rising to the inner or flow part of the water space through pipe *H*. The heater is manufactured by the America Heating Co., Rockford, Ill.

WEATHERED HOT WATER HEATER.

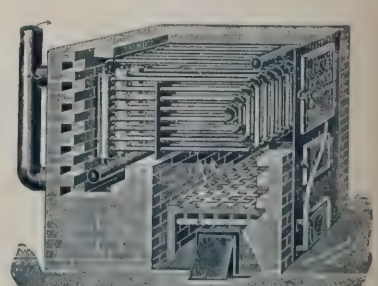
It will be seen by reference to the accompanying cut that this heater consists of two shells, one inside the other, leaving a space all around for water. The shells are bolted together, the joint being thoroughly calked with cast iron borings. As shown, a flat pan or dome, connected with the inside shell at top and bottom, occupies nearly the whole of the interior space of the heater with the exception of sufficient openings for the smoke to pass through. After the gases pass the first dome they impinge upon the second, passing through the center opening and strik-



ing the top of the heater, and pass thence through the smoke box to the chimney. The waterways are ample, the circulation direct, and the construction simple. Seven sizes of this heater, besides two sizes of self-feeding or magazine boilers, are made by the manufacturers, Thos. W. Weathered's Sons, 244 Canal street, New York.

TORRENT WATER TUBE BOILER.

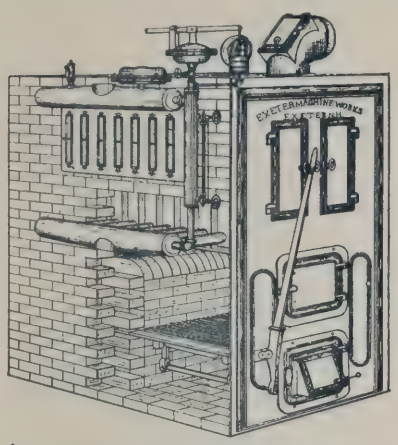
Hayes & Falls, 290 Church street, Rochester, N. Y., manufacture these boilers for heating by steam or hot water. The construction may be seen by a glance at the cut. The steel water tubes are connected to vertical manifolds at the rear and project over the fire space in the front, as shown, the returns being received at the large horizontal tube beneath the manifolds. The circulation is through the lower half of the manifolds, the lower and vertical parts of the heating tubes, the upper part of the manifolds, and thence to the large horizontal tube at the top in front. The heated gases rise from the fire space in front among the heating tubes, over the baffle plate, down among the tubes at the rear, and thence through the smoke pipe at the back, in the course indicated by the



arrows. The arrangement is well calculated to secure good circulation and thorough absorption of the heat from the gases.

THE EXETER STEAM BOILER.

The construction of which is shown in the engraving, consists of a series of rectangular sections, each cast with eight openings through it. These sections are arranged over the fire, two



inches apart, transversely to the draft, the openings forming fire tubes, increasing the heating surface, while their walls tie the flat sides of the sections together. Their angles are rounded, and the faces of the sections are corrugated, to permit of contraction and expansion. The parts of each section are connected by nipples, extending to an outside drum common to all. There are no joints exposed to the fire, and any section may be removed without disturbing the others or the brickwork. The damper regulator may be adjusted to any desired pressure, and acts automatically. A safety valve is also provided, and a simple but effective shaking grate. The manufacturers are the Exeter Machine Works, of Exeter, N. H., and Boston, Mass.

THE MULFORD STEAM AND HOT WATER BOILERS

Are constructed of cast iron sections put together by a series of water rings. Above the hollow fire pot or magazine, which rests on a base forming the ash pit, are the water ring sections, some of which are crossed in the center by tubes, the tube sections being alternated so that the gases pass up in a zigzag course, compelling a thorough absorption of heat by the water in the cross



tubes and sections. The latter are held together by steel rods, and form the combustion chamber. The fire and gases pass up the inside and down the outside, completely utilizing the whole surface of the boiler for heating the water within. The flues are so arranged that the water is compelled to take up a maximum of the heat from the gases, leaving only enough to maintain the draft. These boilers are provided with an improved corrugated rocking and dumping grate. They are made by the Mulford Heater Co., Galva, Ill.

THE DUNNING STEAM BOILER

Is shown in brick-set form in the accompanying cut, Fig. 1. It is made of heavy, homogeneous wrought iron in a manner similar to that employed by the manufacturers, the New York Central Iron Works Co., Geneva, N. Y., in making their power boilers, namely, the tubes are expanded into the heads and every joint is hot-riveted and calked, no packed or screwed joints being used. The products of combustion pass from the fire pot through the tubes and thence around the shell, the draft

Fig. 1.

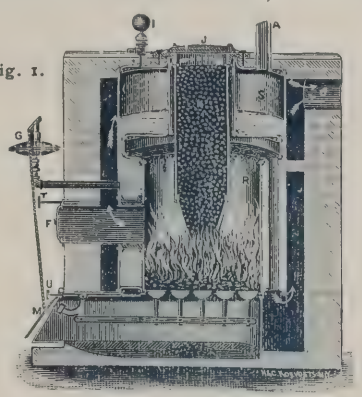
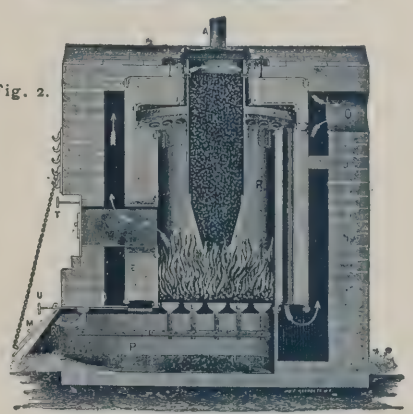


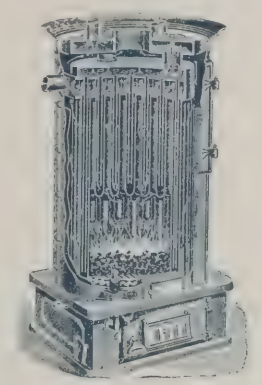
Fig. 2.



through the tubes being downward. This keeps them clean and allows the soot and dust to be deposited at the base, from which place it may be readily removed through the cleaning-out doors. The boiler is of the self-feeding or magazine type, and is fitted with all improved automatic features. The Dunning hot water boiler, shown in Fig. 2, is similar to the steam boiler in construction, the live coals being in direct contact with the water leg, and the products of combustion impinging directly against the crown sheet, being deflected and drawn through the tubes to the base, whence they pass entirely around the outside shell before finding exit at the smoke pipes.

DIRIGO HOT WATER BOILER.

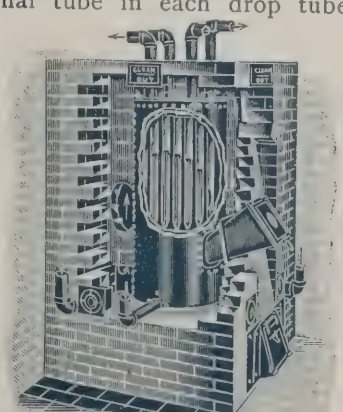
This boiler is of the drop tube pattern, the downflow tubes being inside of and reaching nearly to the bottom of the upflow tubes. The latter are closed at the lower ends by welding, and as they expose a very large surface to the direct radiation of the fire, a positive and rapid circulation is secured. The tubes are arranged in circles, those in the outer circle being longer than the others, extending down to the bed plate, supporting the weight of the boiler and forming a water lining for the fire box. Between these last



mentioned tubes fire tiles are placed, so that about two-thirds of the fire pot lining is brick and one-third water tubes. The fire bricks may be readily removed or replaced. The top and sides are composed of wrought iron pipes, through which there is a constant current of water, which prevents any sediment collecting. The products of combustion pass up among the drop tubes, then around and over a lower dome, and under and out through center of an upper dome. The boiler is manufactured by the Dirigo Heater Co., 51 Oliver street, Boston.

SHEARLOCK HOT WATER HEATER.

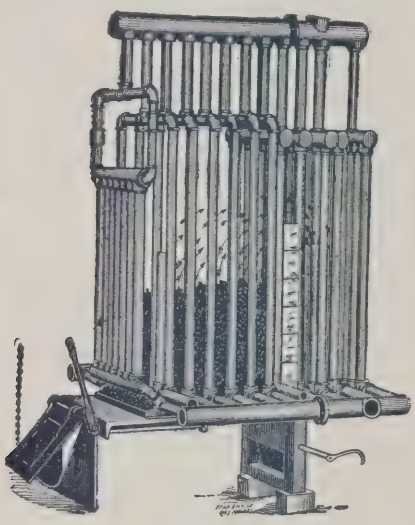
The fire box of this heater is of $\frac{1}{4}$-inch steel plates, forming a $1\frac{1}{2}$-inch water leg surrounding the fire and extending to the grate. Riveted to the top of the water leg is the water chamber, in which are a series of 3-inch flues through which the gases pass from the combustion chamber, the space in the crown sheet not occupied by the flues being utilized by 1-inch drop tubes, which extend nearly to the feed door, thus utilizing every available inch of fire space. After passing through the flues, the gases are diverted across the top of the heater, down the front to the bottom and up the rear to the flue connection. The internal flues are expanded into the crown sheet and the boiler head; and the drop tubes, which are of extra heavy pipe, are screwed into the crown sheet. A small internal tube in each drop tube in-



creases the rapidity of circulation. The New Haven Heating and Plumbing Co., 75–83 Court street, New Haven, Conn., are the manufacturers.

PHELPS' IDEAL HEATER.

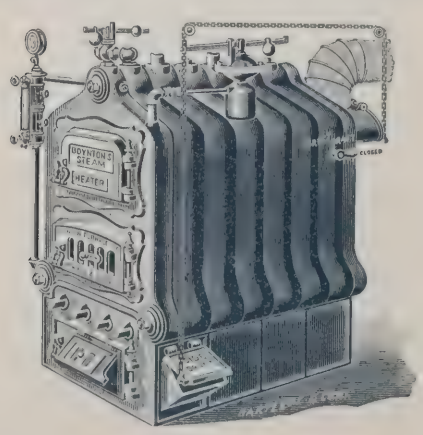
The large fire surface of the hot water heater shown in the accompanying cut is composed of wrought iron tubes so arranged that it is exposed to the direct rays of heat from the fire, insuring a rapid vertical circulation. The heater is specially adapted for burning Iowa soft coal, the soot being thoroughly consumed by the hot blast arrangement used. By this a quantity of fresh air is taken in at the base of the heater and carried up along the



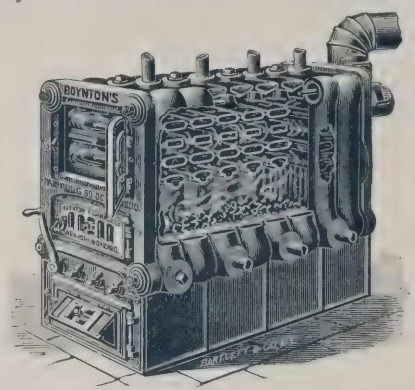
side of the fire pot and when heated to an extreme heat, is discharged into the soot and gases just above the coal in the fire pot. The combining of the soot and gases with the oxygen at this intense heat consumes them before they pass through the fire surfaces, adding very materially to the effectiveness of the fuel. The heater has been designed to offer the least possible friction to free circulation, and being constructed of wrought iron the heat is quickly transmitted and liability to cracking during expansion and contraction avoided. The Ideal Heating Co., Oskaloosa, Ia., are the manufacturers.

BOYNTON STEAM AND HOT WATER BOILERS.

These heaters are manufactured by the Boynton Furnace Co. of New York and Chicago. The joints are planed, so that they meet accurately, and are made tight by a durable packing, there being three joints to the section in the steam heater and four in the water



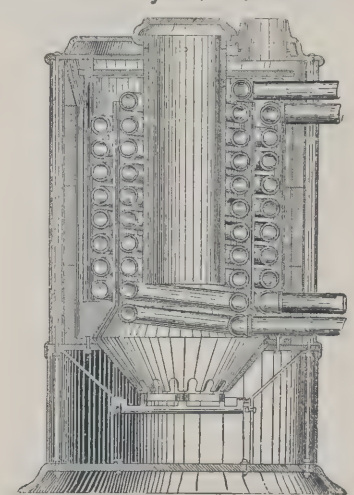
heater. A part of the latter heater is broken away in the cut, to show the interior. The flames and gases pass through continuous return flues, thereby exposing a large heating surface to the direct action of the products of combustion. Large clean-out doors make easy the removal of soot from the flue



surfaces. The heaters are fitted with triangular revolving grates, acting independently of each other, and having a novel attachment to prevent their burning out. The water boilers are made in 17 sizes, to heat from 6,000 to 200,000 cubic feet of air space. The steam boiler is made in 14 sizes, for 300 to 2,300 square feet of direct radiation.

GURNEE HOT WATER HEATER.

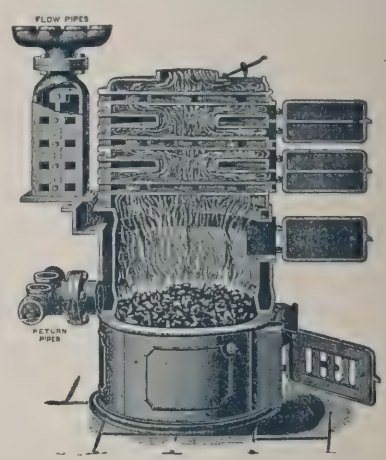
The accompanying sectional cut shows the improved hot water heater manufactured by P. G. Gurnee, of



Kingston, N. Y. It consists of two steel cylinders, one within the other, the space between the two being filled with a non-conducting material. Within the inner cylinder is a fire pot, which, with its connecting self-feeding coal magazine, has a large capacity. The water is heated in coils of steel pipe, placed within the inner cylinder, the pipes employed for connection with the radiators being about the same size as those in the heater. The coils are placed directly over the fire pot, and the water being confined in a small space, rapidly becomes heated and immediately establishes a circulation. The heater is made in four sizes, with fire pot from 16 to 28 inches and heating capacity from 12,000 to 60,000 cubic feet.

THE SPENCE HOT WATER HEATER

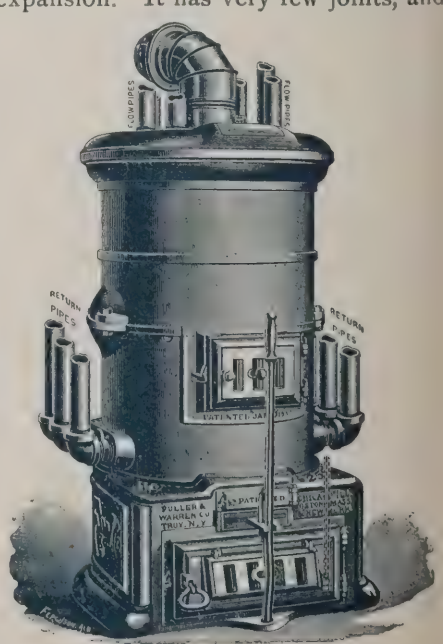
Has an ash pit of ample depth, a cast-iron base, giving plenty of air space, lifting and sliding draft dampers, and large clean-out and clinker doors. The fire pot consists of two hollow rings connected by tubular passages, giving a corrugated surface. The sections are of two patterns, alternating, one with a flue in the center, the other with several small flues near the periphery. This arrangement is very well shown in the engraving, as also the course of gases from the fire pot to the smoke flue. Enough sections are used to absorb all the available heat. The water pot, shown swung around at the left, connects the fire pot with the sections, the latter being held in place by bolts passing through the water post in such a manner as not to be affected by contraction or expansion. The surfaces in contact are milled true, giving perfect metallic water joints. The Spence is manufactured by the



American Boiler Co. of New York, Chicago, and several other cities.

F. & W. CO. HOT WATER HEATER.

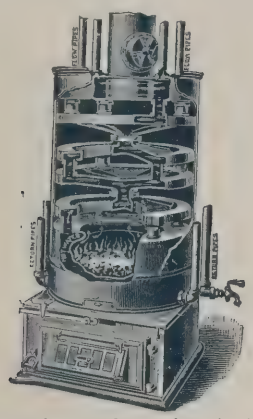
Though the engraving shows only one type of heater made by the Fuller & Warren Co. of Troy, N. Y., they also manufacture combination warm air and hot water heaters and steam heaters. These heaters are made wholly of cast iron, every foot of surface above the ash pit is direct water heating surface, exposed to the direct action of the fire, hence perfectly adapted to abstract a maximum of the heat generated. Its water heating surfaces are self-cleaning. All sections above the fire pot are connected with nipple joints, the faces being planed and fitted, leaving no chance for leakage by contraction or expansion. It has very few joints, and



may be changed from a water to a steam heater by removing the section from which the flow pipes are taken and substituting a steam chest.

HUB HOT WATER HEATER.

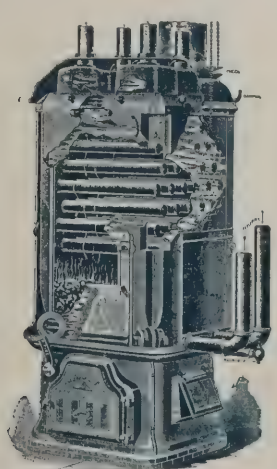
This heater consists of an overhanging water shell fire pot connected with five sloping annular sections which form an inclined water-way, through



which there is perfect circulation with the least possible friction. The overhanging water shell of the fire pot brings the water surface directly over its hottest part, so that the upward impulse to the water is received as soon as it enters the base of the heater, and is steadily augmented during its passage through the inclined sections. The radiator sections are joined to the fire pot and are connected with it by short, extra heavy steel tubes. All connections are by screw joints. This arrangement does away with packing, and gives permanent protection against leaky joints arising from expansion or contraction. No bolted or packed joints are used, all the joints being screwed together. The Smith & Anthony Co., 48–54 Union street, Boston, Mass., are the manufacturers.

BERMUDA HOT WATER HEATER.

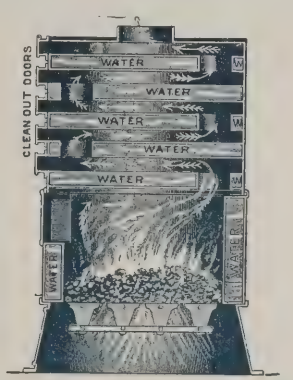
This boiler is composed of four upright hollow sections connected at their lower corners by strong bolts and gaskets, which form water-ways. They are connected to the hollow top in like manner, from which the water passes to the flow pipes. Return pipes connect at the bottom on either side, thus forming a water shell around the fire pot and combustion chamber. Screwed into the side shells are water tubes, closed at their outer ends, and extending across the chamber, as shown in the cut. The rows of tubes are alternated or staggered, so as to secure the best

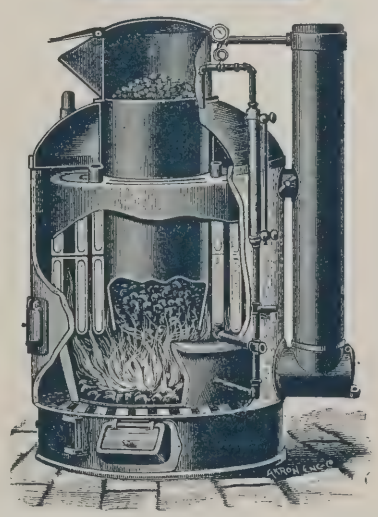


results from the impingement of the heated gases; and each tube has an internal diaphragm to insure active circulation. After passing through the smoke holes in the top, the gases are deflected down outside between the boiler and outer casing before passing away to the flue, thus utilizing as much of their heat as possible. Ample facilities for inspection and cleaning are provided. The Co-operative Foundry Co. of Rochester, N. Y., are the manufacturers.

COLUMBIA STEAM AND HOT WATER HEATERS.

The Columbia steam heater, lower cut, is constructed of cast iron. It consists of a series of hollow water sections and dome, circular in form, andconnected by water-way openings and flues. The latter extend one-third of the way around the rings and are extra large, giving positive draft through the heater. The water-way openings are of sufficient size to circulate the water freely between the several sections. The fire pot is conical, and is also a water section, being connected with the other sections by openings. The steam dome is large,

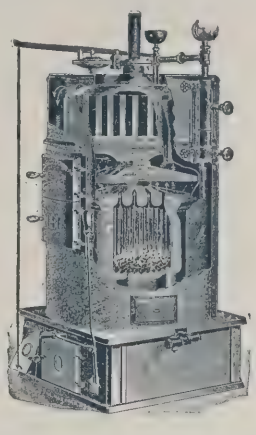




and carries no water, and as the heated gases come into contact with its bottom, dry steam for the radiators is assured. The magazine consists of water sections suspended from the dome and communicating with it by openings. The reservoir holds fuel enough for 15 to 24 hours. The heater is surrounded by a triple non-conducting jacket to prevent radiation. The construction of the Columbia hot-water heater is so clearly shown in the small cut as to render further explanation unnecessary. Both heaters are manufactured by The Canton Mfg. Co. of Canton, Ohio.

PAGE LOW PRESSURE STEAM HEATER

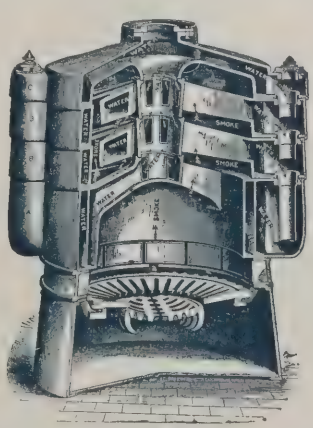
Is cast in three parts, the water-jacketed fire pot, an intermediate section, and the steam dome, screwed together by means of lathe-cut threads. The fire pot has small corrugations inside and larger ones outside, as may be seen in the cut, thus doubling its heating surface. The hollow crown sheet, which also is a water space, and the in-



termediate sections are provided with numerous radial openings, throughwhich the products of combustion pass up to the space surrounding the steam drum (also corrugated), whence they pass down, in contact with the outer surface of the boiler, as shown by the arrows, and thence to the smoke outlet. The joints are faced, metal to metal, so that no packing or gasket is required. W. C. Mowry, of Norwich, Conn., the manufacturer, states that he furnishes with each boiler a water column, two gauge cocks, a water and a steam gauge, a safety valve, and an automatic regulator.

THE NOVELTY CIRCULATOR.

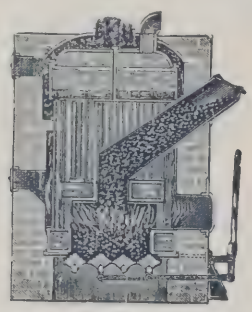
The general design of this water heater is shown in the cut. It is composed of five or more sections; namely, the ash pit section, a fire box, one or more intermediate sections (two are shown in the cut), and a top section. The intermediate and fire-box sections are provided with radial arms connecting the annular water spaces outside with the upflow space in the center, the arms of one section alternating with the spaces of the sections above and below. The top section has a continuous water-way, as shown. The circulation is down through the connecting lugs *C*, *B*, *A* (which are the coolest part of the heater) to the annular water spaces, in through the radial arms, and up through the inner space to the outflow, as indicated by the arrows. The sections are connected by means of nipples in the lugs, through which the



downflow passes. This type of heater was developed by Mr. John J. Hogan, and it is manufactured by the Abram Cox Stove Co. of Philadelphia, Pa.

BRONSON WATER TUBE BOILER.

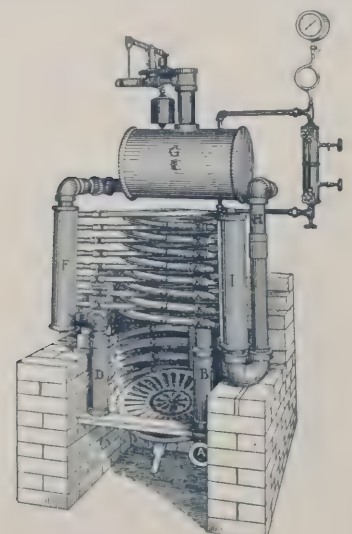
The sectional view of this magazine, base-burning, steam and hot water boiler, given here, shows clearly its construction. By the peculiar construction of the grate a largely increased air space is secured, resulting in complete combustion of the fuel. The method of rocking the grate by means of a lever will be understood from the cut. The tubes are expanded into the rings, precluding the possibility of leakage, and as they are vertical, they are easily kept clean. The magazine holds a day's supply of fuel. The gases pass outward through a double row of tubes, then upward, and are deflected back between the tubes to the center, back to the outside again, and finally around and over the steam dome to the outlet. By this arrangement of vertical tubes and repeated horizontal deflections of the gases among them a rapid circulation of the water is maintained and a maximum amount of heat is absorbed from the gases. They are built for brick



setting and also with jacket for the portable style. The boiler is manufactured by the Weston Engine Co. of Painted Post, N. Y.

THE SPRINGFIELD COIL BOILER

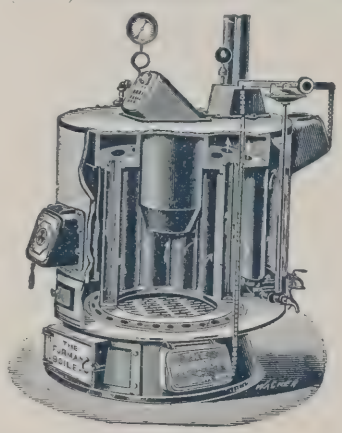
Is made by the Springfield Coil Boiler Co., 48 Hampden street, Springfield, Mass. It is shown in the cut without setting. Feed and returns enter at *A*, rise through *B*, pass through coils *C* to *D*, and up through *E* and *F* to drum *G*. The downflow is through *H* to *I*, whence it circulates through the flat coils *J* to *F* and back to *G*. This insures constant circulation, preventing the formation of scale. Coils *J* are each 18 feet or more in length, according to size of boiler, are of any



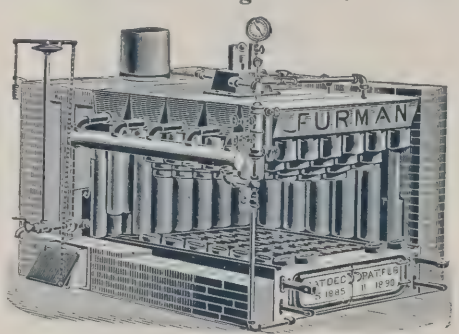
desired size and number, and may be easily removed or replaced by means of the joints *X*. All pipes are extra heavy, and are bent by special machinery. The grate is double acting and center shaking, the middle turning faster than the outside and in the opposite direction. These boilers are built for both power and heating, some of them running at 160 pounds pressure.

FURMAN BOILERS.

The Herendeen Mfg. Co. of Geneva, N. Y., manufacture these boilers



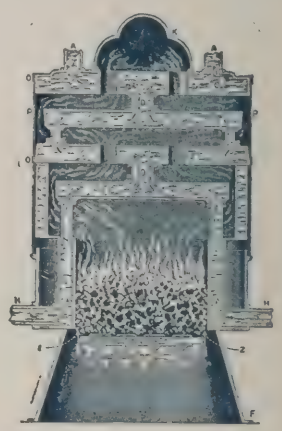
in various styles and sizes, for both hot water and steam. Two styles of the boiler are shown herewith, both for steam, one of the portable style with fuel magazine, and one for a brick setting. They are made of cast iron, due allowance being made in the construction for free expansion and contraction. All water connections are screwed together. In the portable boiler the base plate supports a circle of vertical water tubes surrounding the fire space. The upper end of each tube is screwed into the water dome, the lower end being closed. A dia-



phragm extending nearly to the bottom divides each tube into a down-flow and an up-flow, the latter being next the fire. In the surface burner a number of drop tubes take the place of the magazine. At the rear of the boiler, in the smoke passage, are several large tubes, which receive the returns at the bottom and discharge into the dome at the top. In the brick-set boiler the same general lines of construction are followed, except that the dome is made up of a number of sections connected together. Drop tubes are used, there being no magazine, and there are several rows of back tubes at the rear.

ECONOMY HOT WATER HEATER.

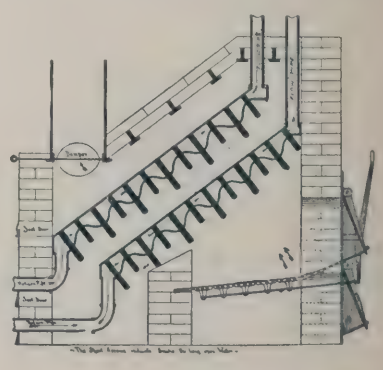
It will be noticed in the accompanying transverse sectional view that the sinuous course of the water circulation in this heater is of the same character as that of the gases of combustion. An unobstructed water course is formed a number of times over the fire, at its highest temperature, and at no point can the water entering the fire pot find exit without repeatedly passing over the fire and its products. The products of combustion, after impinging against the under surface of the water space immediately over the fire pot, is deflected at its highest temperature against the water sides, then after surrounding the first section, the full force of the heat takes effect upon the lower side of the second section. The gases then pass up through the flues near the center of the large section, entirely surround the second small section, and after contact with the under surface of the top section, make their exit at the smoke flue. It will be noticed that the grate is suspended in the ash pit lower than the bottom of the fire pot, and is of a smaller diameter. This gives an extra draft around the grate, securing thorough combustion of the fuel contiguous to the hollow fire pot. This



furnace is manufactured by the J. F. Pease Furnace Co. of Syracuse, N. Y.

STANTON HOT WATER HEATER.

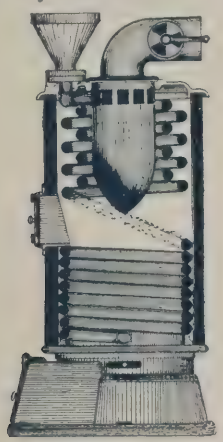
The accompanying cut shows a brick-set boiler in which the products of combustion, after rising to the highest point of the brick-lined fire box, have to pass down through the projecting studs and over the waves on the under side of the boiler, until they reach a point below the grate bars, where the direction is again changed as indicated by the short arrows, the smoke finally reaching the outlet shown at the back of the heater. The water enters the heater at the bottom and spreads out into a thin, wide sheet, flowing rapidly upward to the flow pipes. Besides adding to the heating surface, the studs connecting thetop and bottom sheets of the boiler serve to make the heater strong and durable. No packed joints are used, and but three screw joints are exposed to the fire. The heater is



made by Henry Stanton of Flushing, O., and is of cast iron, in two sections, connected at the walls, with malleable iron fittings.

AMERICAN HOT WATER HEATER.

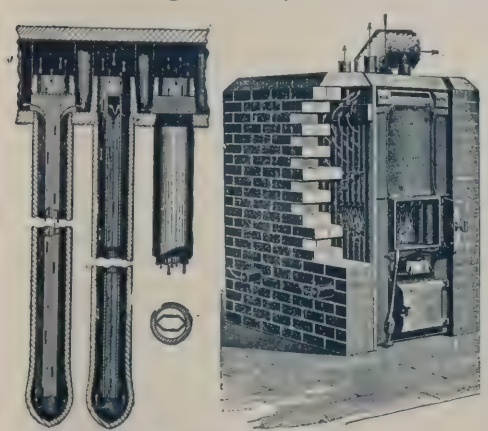
As shown, this heater is made up of jointless coils of wrought iron pipe, so that liability to leakage from expansion and contraction is reduced to a minimum. As there are no sharp curves to create friction a rapid circulation is assured, and as all parts that come in contact with fire are protected within by water, damage by burning out is prevented. All the heat that is flung out against the sides of the fire pot is absorbed by the water in the coils surrounding it, while that which rises is taken up by the water in the coils



above. The heater is manufactured by the Whitlock Coil Pipe Co., Elmwood, Conn.

FARQUHAR'S HOT WATER HEATER.

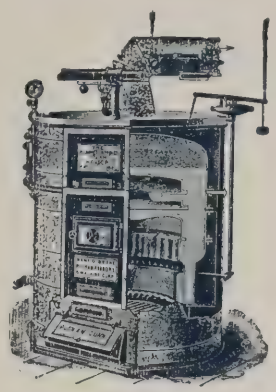
As shown by the accompanying cuts the inside chamber of the drop tube carries the downward current. The top of this tube draws the coolest water from the bottom of the water head, and conveys it to the bottom or point of the drop tube, where it is brought into contact with the heating surface. The drop tube at this point is expanded, so that the change of direction of the current will not retard its flow. The water rises while in close contact with the heating surface, and is discharged at the top into the upper part of the water head, where it flows toward the outlets or flow pipes, being separated from the cool water. The openings of the inner and outer tubes at the top are entirely separated, so as to prevent interference of the upward current with the downward current. The downward currents do not touch the heating surface, but the entire



heating surface is acted upon by water in ascending currents. The Farquhar Heating Co., 58 Dearborn street, Chicago, Ill., are the manufacturers.

THE PLUMMER STEAM HEATER,

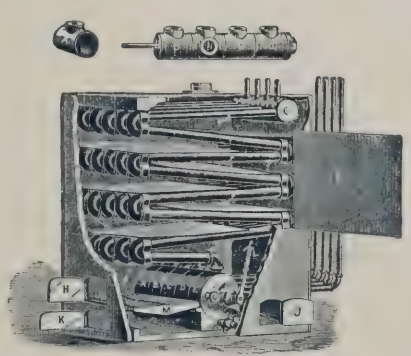
Manufactured by the Putnam (Conn.) Foundry and Machine Co., is shown, partly in section, in the engraving. It is a low pressure boiler, but is tested to



sixty pounds pressure. It is constructed wholly of cast iron, with planed joints, the only packing used being thin asbestos paper. The boiler consists of four sections, fire pot, crown sheet, intermediate section, and steam dome. Each boiler is provided with safety-valve, gauge cocks, water gauge, and automatic regulator.

LITTLE WONDER HOT WATER HEATER

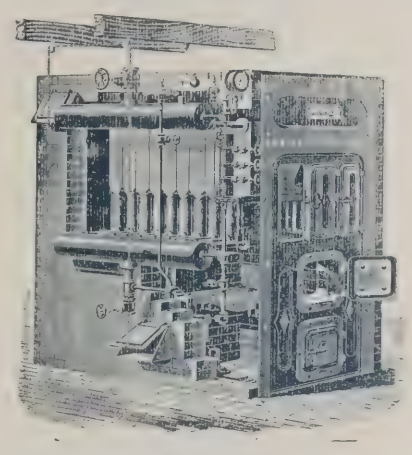
The sectional hot water heater shown in the cut presented herewith is constructed so that it may be readily set up or taken apart The cut shows the heater set up with the casing cut away so that the interior can be seen. The water in course of circulation is received from the return pipes at back of heater and passes into the drum lettered *A*, *B*, *C*, etc. This drum is cast in sections, which are held together by bolts and nuts *G*, the joints being tongued and grooved and made water tight by as-



bestos packing. Each section is put together as a unit and then all are bolted securely together. The water rises in its upward circulation and passes through the pipes until it reaches the drum at the top, from whence it goes to supply the radiators wherever needed. To extend the heating surface among the tubes a portion of each layer of pipe is covered with an iron plate lettered *T*, front and back alternately, and the gases follow the direction of the arrows shown in the cut, and are thoroughly distributed and brought into contact with the surface of the tube. *M* represents the grate, *H* the fire door, and *K* the ash pit opening, while *J* is the door which permits of getting into the rear of the heater for cleaning. Chas. T. McLellan, Easton, Pa., is the patentee and manufacturer.

WALKER & PRATT STEAM BOILER.

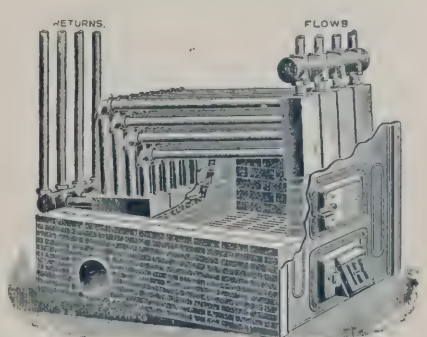
Among the steam and hot water heating apparatus manufactured by the Walker & Pratt Mfg. Co. (31–35 Union street, Boston, Mass.) is the safety steam sectional steam boiler shown herewith. It consists of a series of cast-iron sections placed side by side in a brick setting. Each section is complete in itself, and is connected to a steam drum and a water drum, by means of which any number of sections are united to form a boiler of the desired capacity. These drums are placed outside the setting, for convenience in connecting the main supply and return pipes. Nearly all the surface of the sections is exposed to the direct rays of the fire, and the products of com-



bustion pass three times through the boiler before passing to the chimney at the rear. The fire box is lined with fire brick, and all parts are readily accessible for cleaning.

THE LEWIS HOT WATER BOILER.

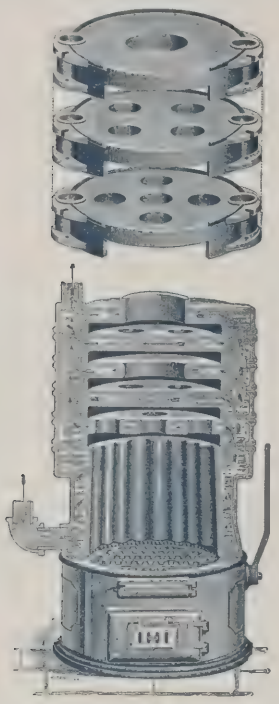
As shown in the interior view presented herewith, this boiler is of the sectional water tube variety. Each section is composed of 8, 12, or 16 tubes of such length, considered with the width or number of sections, as may be necessary for the duty proposed. The vertical tubes are threaded right and left, and have sufficient length to allow for expansion of the horizontal tubes. The tubes may be increased in number without increasing the number of sections, and may be easily and quickly renewed if it should become necessary. There are but two lock-nut nipples to each section. The Lewis Boiler Co., 32 Oliver street, Boston, are the manufacturers. The steam heater manufactured by this company is similar, in general appearance and construction to the hot water heater, a large steam



drum being added. The heater is fitted with patent shaking grates and with automatic appliances for controlling the fire, temperature, etc.

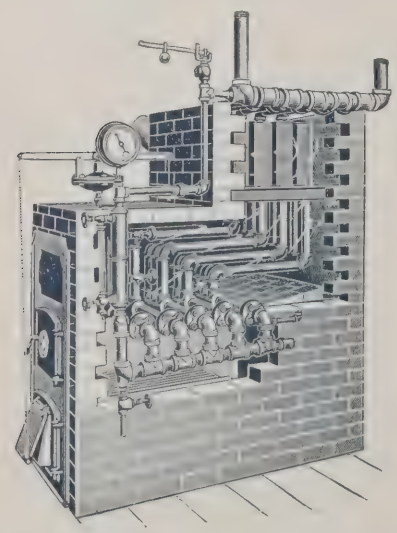
IDEAL HOT WATER BOILER.

This recent addition to the list of house heating boilers is shown in the accompanying sectional and detail views. The water enters just above the grate, passes around the fire pot to the water column at the opposite side, thence through each of the horizontal sections to the opposite water column, and to the flow pipe, as indicated by the arrows. Each section is independent of the others, so that when only a slight fire is needed, the water in the lower sections will be heated and pass direct to the outflow, so that circulation is assured at all times. This boiler has recently been placed on the market by the Ideal Boiler Co., 88 Lake street, Chicago.



THE WHITWORTH SECTIONAL BOILER,

Shown by the cut presented herewith, is made of wrought-iron pipe with a cast-iron steam chest. Each section is entirely separate and free to expand and contract freely, and each has a six-branch header which extends across the fire box thirteen inches above the grate and bears on the side wall. The steam chests are 4½ by 12 inches, and 22 inches long. The size of the boiler depends upon the number of sections used. This boiler is manufactured by the Whitworth Heating Company, of Worcester, Mass.



Closed Hot Water Systems.

A. C. Edgar

The different methods of arranging hot water heating apparatus to be operated under pressure are generally referred to as "closed" systems to distinguish them from the system that is at all times open to the atmosphere. We will first consider the methods usually employed when installing these systems, and refer to them hereafter as first, second, and third.

The first is the system of boiler, pipes, and radiators that is sealed with a plug or cap after once filling with water. This system is operated under unknown pressure, and is positively dangerous, often resulting in loss of life and property.

The second is the system of boiler, pipes, and radiators that is operated under a pressure of from five to thirty pounds, according to the requirements. This system is usually employed to maintain steam temperatures in the radiators when the desired results cannot be obtained from the low temperatures of the "open" system. This system is controlled and regulated by a safety valve, which relieves the apparatus of unnecessary pressure; a vacuum valve is also connected to admit air to the apparatus after a discharge at the safety valve. This avoids the creation of a vacuum during the contraction of the water.

The third is the system with properly proportioned boiler, pipes, and radiators which depends entirely upon gravity for circulation, and under ordinary conditions gives satisfaction; but when part of the radiation is any great distance from the boiler, the circulation becomes sluggish, and a safety and vacuum valve are connected, as described above, with the exception that the pressure in this system need never exceed two or three pounds.

That danger always accompanies the first system there can be no doubt and requires no discussion, but now and then we hear of a "practical" mechanic placing a coil in a hot air furnace, or an extra water back in a stove, and connecting one or more radiators to it, with no provision for expansion of water, obtaining "best results and no cost for fuel." A short time since a baker was advised to utilize the "waste" heat in his oven to heat his living rooms. Acting upon this advice, he allowed his "practical" friend to place a coil in the oven and connect several radiators to it, with no provision for expansion of water. An explosion followed and the baker was killed. The public was of the opinion that his death was caused by his own neglect, while his "practical" friend solicits trade in the heating line.

The second system cannot be called dangerous, although it is sometimes operated at a pressure beyond that which is required for heating purposes. The great objection to this system is that it is often unsatisfactory because of insufficient boiler capacity. This is a mistake often made by the heating contractor when estimating the capacity of boiler required. Assuming that a square foot of radiation at a temperature of 215 degrees will give off the same number of heat units whether the heating medium be steam or water, he will allow the same number of square feet of hot water radiation to heat a given space that would be required if steam were employed, and by the total amount of radiation to be used he will determine the capacity of the boiler. Knowing the number of feet of radiation, he consults his boiler catalogue and selects the hot water boiler rated to supply that amount. This is an injustice to the boiler, as the radiation at steam temperature is almost twice as much work on the boiler as when ordinary water temperatures are maintained. The result is that forced firing is necessary when the entire system is in use, which is not only extravagant in fuel but often the cause of condemning the entire apparatus, when an insufficient boiler may be the only trouble.

When properly proportioned and erected, the second system possesses all the good features of the open system at about the same cost as steam.

The third system differs from the second by having sufficient radiation and boiler capacity to fill all requirements at the usual low temperatures of the open system when a rapid circulation is maintained. While many contend that it is possible to maintain a rapid circulation under all conditions, there is no doubt that many attempts have been made to heat large blocks of buildings requiring long horizontal mains that have given very poor satisfaction when gravity alone was depended upon for the motive power. It is also true that many such attempts have given good satisfaction when a pressure of two or three pounds was utilized to assist gravity. Many have the erroneous idea that to maintain a pressure in a hot water system it is necessary to have the radiation at a high temperature. This is generally the objection raised when referring to all closed systems. It is practical, as well as possible, to maintain pressure with low temperatures, and many systems are in operation under from one to five pounds pressure (at the expansion tank) while the temperature of the water need never exceed 180 or 190 degrees, the expansion caused by raising the water to this temperature giving the required pressure when the system is closed.

It may be true of the first and second systems where they are referred to as extravagant in fuel when compared to the open system, but when properly proportioned they require no more fuel than a steam apparatus.

While I make no claim for economy of fuel in the third system over the open one, I am assured from practical tests and observations that it is as economical. Many prominent heating engineers refer to all closed systems as "dangerous," "extravagant," etc., without considering the methods employed, or the reasons for employing them, and numerous "schemes" have

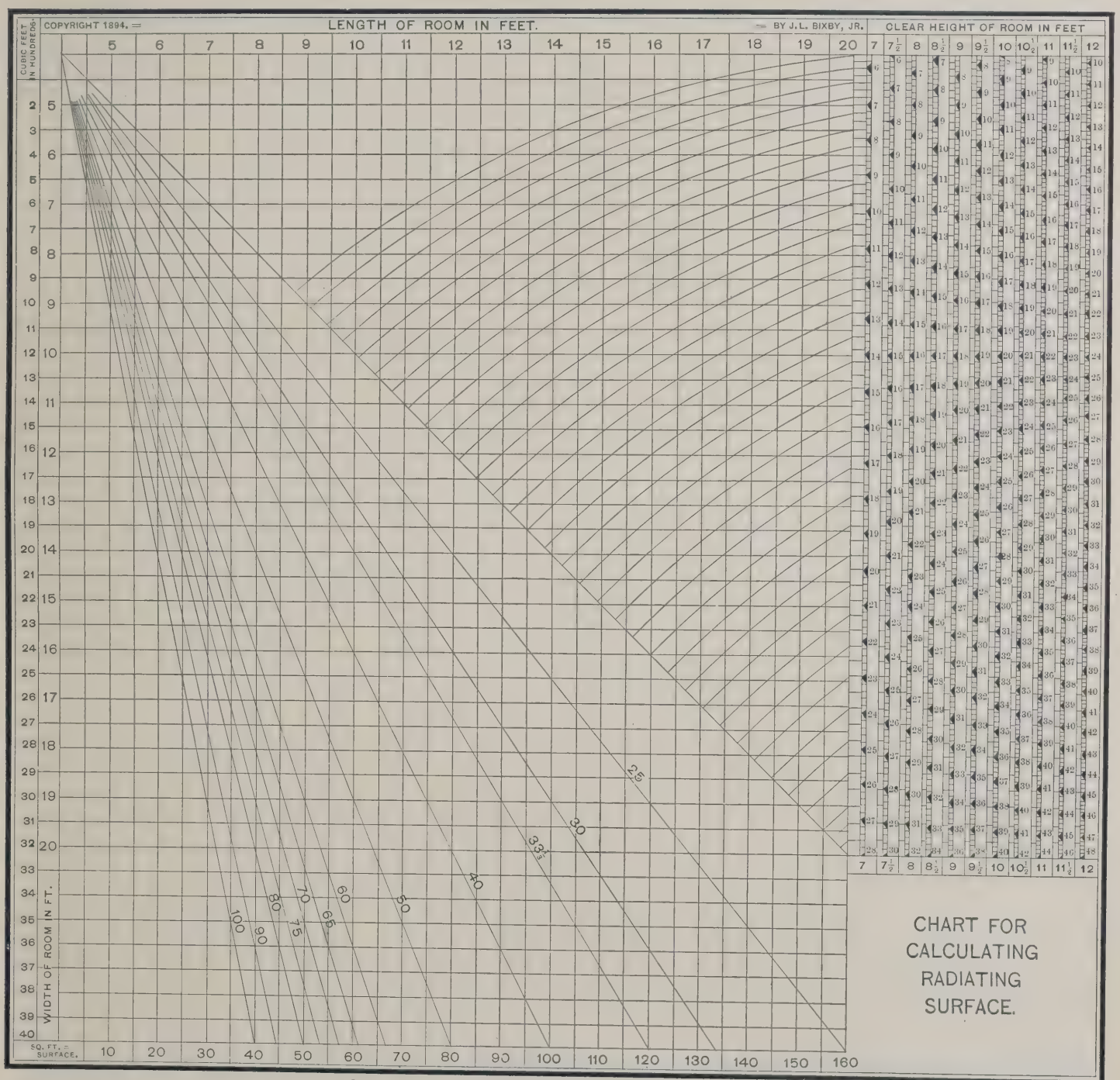
been resorted to where open systems failed to give satisfaction. Pumps, water motors, and many other devices, have been called upon to promote circulation where it would not reach by gravity, always complicating and increasing the cost of the apparatus.

It is not my desire to uphold the closed system in preference to the open in all cases, nor do I think it advisable to adopt it for small work; but when water is to be the heating medium for large buildings, a closed system, as described, with sufficient radiation and boiler capacity will respond more quickly and give as much if not more satisfaction than the open system.

Calculating Radiating Surface.

BY J. L. BIXBY, JR.

The accompanying chart for calculating radiating surface is explained by the following example: Room 14 feet by 16 feet, by 8 feet high, amount of heating surface to be one square foot to every 30 cubic feet of space. In the second left hand column (marked "width of room"), follow the line marked 14 until it intersects with line marked 16 (the length of the room), and having found the point of intersection of lines 14 and 16, approximate the distance from this point to the nearest curved line; follow this curved line until the line headed 20 is reached, then move horizontally towards the right hand side of the chart to the column headed by the height of the room, in this case 8 feet. (Each space between the figures given equals 20; therefore one-half a space equals 10.) Having followed across the chart until column 8 is reached, we find that the horizontal line comes about half way between 1,780 and 1,800, which we would approximate at about 1,790. In the first left hand column find 1,790, or approximately locate its position; follow this point horizontally across the chart until it intersects with the ratio line, in our case 30. Having found this last point of intersection, carry it to the bottom of the chart parallel to the vertical lines. The bottom row of figures shows the square feet of surface required, in our case about 60. The example expressed in figures would be $14 \times 16 \times 8 = 1792 \div 30 = 59.5$ square feet. Owing to the several approximations that are necessary the results are not always exact, but are near enough for all practical purposes.



IN connecting a water gauge, the lower end should be piped to a point considerably below the surface level of the water, and no smaller than a three-quarter inch pipe should be used, and on large gauges 1-inch pipe. The top pipes should be run to the top or near the top of the boiler.

PUMPS should always be drained in cold weather, as freezing of water in pipes or cylinders is sure to burst them. Engineers should therefore be careful and open the drip plugs and cocks which are provided

Warming and Ventilation.—II.

Geo. W. Kramer

CONSIDERED FROM A PRACTICAL STANDPOINT.

It is necessary to consider heating and ventilation independently and analytically in order to ascertain the governing principles in connection with each, before undertaking any combination of the two, or such practical application of the theoretical principles as are absolutely necessary to produce a perfect system.

The successful, perfect, and uniform warming of an architectural structure can only be accomplished by raising the temperature of the contained air. This must be done by the transference of heat from the source of generation to the localities or apartments to be warmed.

The primary desideratum, therefore, is the evolution of heat by the simplest and most economical methods. Before we can do this intelligently we must ascertain what heat is. Concerning this, two theories have been proposed, the material and the dynamic ; the latter is the one almost universally held by modern physicists and is adapted to give a satisfactory explanation of the different pheuomena.

Heat is a form of energy. Cold is a relative term only, and has no existence, but is a *condition* indicating the absence of heat. Among the numerous methods of producing or developing heat are combustion, percussion, friction, compression, etc. Combustion, as one of the many sources of heat, is the only one that can be practically considered. Combustion denotes the chemical combination of a body with any of the substances termed supporters of combustion. In this connection we are restricted to a consideration of the use of available and economical combustibles or fuels, with oxygen as a supporter ; hence we shall treat heat as the result of combustion, and must consider *that* as the only practical method of producing it economically for the purposes under consideration.

Combustion is a term applied to the process of burning, which consists of the oxygen of the air combining with the combustible used as fuel. Thus the combustion of coal consists of the oxygen of the air, passing into a state of chemical union with the carbon and hydrogen of the coal, forming carbon dioxide, watery vapor, etc. Such chemical combinations are always accompanied by the production of more or less heat. At the same time it must be borne in mind that the substances will not chemically combine unless first brought to a high temperature; thus if the oxygen supplied by means of a continuous current of air is not previously heated, a certain amount of energy must be lost in raising it to the necessary temperature before combustion will take place. As this cannot be perfectly done during the process of combustion, there is a consequent loss. In ordinary practice it is estimated that nearly 50 per cent of the oxygen passes away without properly combining. Although the gaseous oxygen has as much to do with combustion as the more solid materials, yet the latter is alone considered the combustible, and the oxygen is invariably referred to as the supporter of combustion.

For the purpose of comparing the resultant heat from various combustibles as fuels, it is necessary to establish a unit or standard of measurement. This thermal unit represents the quantity of heat required to raise one pound of water at 32 degrees one degree Fahrenheit.

By experiment it has been ascertained that one pound of good coal completely consumed will produce about 14,000 thermal units of heat, but in no existing form of grate, furnace, or heating apparatus is this perfect combustion possible, nor can all the heat derived from it be made available for heating purposes. The loss by imperfect combustion, in the air that passes up chimney, and loss by transmission, etc., amounts to over 50 per cent.

For the evolution of this heat a furnace or combustion chamber of some kind must be provided. The requirements of a furnace are determined by certain well-ascertained data in chemistry, metallurgy, and philosophy ; and as these data become established and reliable, recognition should be given them.

The products of combustion are found to be principally carbon dioxide or carbon monoxide, as the combustion is more or less perfect. As these gases are of the character of narcotic poisons when respired separately, and largely so when combined, it is very essential that the atmosphere of the apartments be thoroughly protected from any possibility of contamination.

The combustion chamber must be of sufficient size to permit of perfect combustion and expansion, and for the disposal of these products must be connected with a vertical duct or chimney in which certain proportions must be observed as regards height and area.

Many suppose that a chimney has some independent power of its own, and say it draws. Aside from an induced current caused by the aspirating force of wind passing across its top, the capacity to carry off the products of combustion is entirely dependent on the difference of temperature of the air inside of the chimney and that of the air outside,—the greater the difference the greater the velocity, other things being equal. This should be sufficient to maintain a steady, uniform flow equal to the requirements of combustion, and no more, as a greater velocity means an unnecessary escape of heat.

Smoke is the combustible and incombustible product evolved, and is composed of such portions of hydrogen and carbon as have not been supplied or combined with oxygen. The temperature must be raised at least 900 degrees before perfect combination or combustion is possible.

The next question is the transference of heat to the various localities to be warmed.

Heat is communicated from one body to another by three processes, radiation, conduction, and convection. As we must warm the *air* of the various compartments, we must consider the method best adapted. Radiant heat will pass *through* air and gases in straight lines and at great velocity, but will *not* warm the medium through which it passes to any appreciable degree, while conducted heat only passes from one particle of matter to another, at insensible distances ; consequently neither method can be used directly. Unless the apparatus is located in the apartment to be warmed, we must impart the heat to some moving body, and *convey* it to the distant apartment. This is *convection.* Fluids and gases are the only available moving bodies ; water and steam may be considered the available fluids, and air the gaseous body.

As air is the body we desire to warm, the natural conclusion would be to use it as the medium of conveyance. Now as heat passes readily from a solid to a liquid or gas, and conversely, but with difficulty from one particle of a liquid or gas to another, it is necessary, if possible, to bring every particle of the air to be warmed into contact with some heated solid surface, as the air must acquire heat by *contact* with some heated surface. There must be a limit to its capacity to absorb heat, which we should ascertain. This quality is designated specific heat. Again, using water as a standard and representing its capacity for heat as unity, air will be found to absorb less than one-fourth the amount of heat, but as water is about 800 times as heavy as air—comparing equal volumes—one cubic foot of water will absorb nearly as much heat as 3,000 cubic feet of air; consequently we represent the specific heat of water as unity, and that of air as .2377,—taking equal weights.

Another peculiar property of heat is that all bodies of whatever temperature radiate or absorb heat. This process continues until all bodies subject to the same *conditions* acquire the same *temperature.* This is known as the law of exchanges. Observance of these laws enables us to uniformly warm all contents and walls of apartments, subject however to external influencing conditions.

As no body can impart more heat than it contains or has absorbed, and as every intervening medium, conveyance, or transfer causes a loss, the natural conclusion is that the direct heating of a body of air and its direct transfer to the apartments to be heated is the simplest and at the same time most economical and efficient method, conditional that a furnace properly proportioned for the combustion of the necessary amount of fuel to produce the requisite quantity of heat, under the most favorable conditions, shall develop sufficient surface, which, coming properly in contact with the air at the velocity necessary to meet the requirements of ventilation, shall raise the temperature 70 degrees, if necessary, and maintain this condition with ease.

On the assumption that this theory is correct, we must consider the ma-

terials of which to construct our furnace or combustion chamber. For this purpose we must use the best available conducting material. Taking into consideration the fact that the furnace must be air-tight and substantial, we conclude it must be of metal. The comparative value as conductors of the various available metals is approximately, copper .90, brass .75, cast iron .52, and wrought iron 44. On account of the low temperature at which brass and copper melt they would not be available. Cast iron ranks next, provided there are no objectionable features, which must be considered later. With an ascertained heating value for the fuel and a knowledge of the volume of air to be heated, we can determine the amount of fuel which must be consumed to produce this heat.

Taking time as a factor, a possible requirement of changing the air once in twenty minutes will necessitate heating three times this quantity of air per hour. The size of furnace must be equal to the proper combustion of the requisite quantityof fuel in the indicated time; the combustion chamber must be of sufficient capacity to allow for expansion, and the chimney must be properly proportioned to carry off all the products of combustion. The exterior of the furnace must be of such form and development as to subdivide the air and offer a large conducting surface, and so arranged that the particles of air can come into proper and direct contact.

By experiment we must ascertain the development and form of exterior surface best adapted to secure this result. As air will only absorb heat by contact with heated surfaces we must arrange to utilize the radiant heat emitted also. This we can only do by placing some material which is a good conductor for the interception and absorption of the radiant rays; then bringing air in contact, the heat can be taken off by conduction.

The natural velocity at which air will pass over these surfaces under the different conditions and resistances must be ascertained. We must also ascertain the maximum velocity at which air can be passed over these surfaces and absorb heat in transit.

As the retarding influences vary in each individual application, we must by some means endeavor to secure a *constant* current of air passing over the heated surfaces which shall equal the heat-producing capacity of our apparatus. Less than this will result in overheated surfaces and unpleasant conditions, which will be considered later; more than this will result in failure to properly warm

The distance and location of the apartments to be warmed from the source of heat, and the character of conduits, are also factors to be considered, as it may be necessary to take advantage of the superior absorbent qualities of water and the ability to transfer it, either locating the heating device as a secondary apparatus much nearer the apartments to be warmed, or by subdivision to present a larger uniformly heated surface to the air to be warmed; in which case the development, division, and temperature of surface capable of imparting the desired temperature to a given quantity of air in a specified time must be determined by experiment, as theory is always largely dependent on the demonstration of actual experiment before it can be reduced to practical and reliable form. Thus as we have ever varying conditions we shall meet ever varying problems. Before undertaking a practical solution we must consider the conditions and requirements of ventilation and its connection with a perfect system. A comparison of various methods of heating must include the cost of apparatus, cost of attendance, cost of fuel, cost of proper installation, and the incidental advantages and disadvantages belonging to each.

The foregoing calculations have all been made with reference to a possible system of ventilation, which is an essential and inseparable part of every perfect system of heating.

Summer and Winter Ventilation in Schools.

W. D. Dickson

In winter when the school rooms are closed there must be a sufficient circulation to keep the air in the room pure and healthy.

The best authority gives as a minimum amount of air for each pupil 2,000 feet per hour. In connection with this air circulation it is necessary to construct the heating apparatus so that it will warm the air to the proper degree to heat the room to a uniform temperature of 70 degrees. Any system that will do this may be considered as fulfilling all the requirements in a properly heated and ventilated school. For winter ventilation the air should be admitted to the room near the ceiling and taken out at the floor line. In fact this is the only way that a room can be thoroughly heated to a uniform temperature on all sides.

In summer ventilation the conditions are exactly opposite. It is better to admit the air at various places around the room, so as not to cause any perceptible draft, and the openings into the exhaust flues should be at the ceiling. Summer ventilation has been tried in various ways, the object being to try to keep the room cool by keeping the windows closed and allowing the supply of air to come through what was the heat flue for winter use. But all these efforts have failed, from the fact that a much larger supply of air is required in the summer in order to keep the room cool and comfortable than is actually required to keep the air pure. It is not absolutely necessary to introduce more air in the summer than in the winter in order to keep the air pure and healthful, but the problem is, how to keep the room cool enough to be comfortble.

The more air that can be introduced in warm weather the better satisfaction it gives, and all windows are thrown open for that purpose. Opening doors and windows destroys any system of ventilation where the air is brought in through the heating apparatus. More particularly is this true where all of the ventilating flues merge into one general stack, as the opening of a window in one room allows a free flow of air, and the current passing into the general stack dams up the incoming air from some other room where the supply is not so copious.

If the opening of a window or door destroys the system, of what use is it to plan summer ventilation in connection with winter ventilation, as summer ventilation is obtained in one way, and one way only, and that is by opening the windows, admitting all the air that can be obtained, and the more the better?

As I said before, it is not the amount required to keep the air in the room pure, but it is the amount required to keep the room cool, that is most desirable in summer.

I have made frequent visits to schools for the purpose of examining different systems of summer ventilation, to see if the rooms could be kept comfortable with the windows closed. It was claimed by the contractors putting in the system that the windows could be kept closed, and by drawing the air in through the heating apparatus in the summer that the rooms could be kept cooler if the windows remained closed. This I found to be a mistake. In talking to the principals and teachers, they all agreed that it is better to open the windows as soon as the temperature outside reaches 70 degrees. "We have tried keeping the windows closed," they say, "and the air soon becomes very stifling, and it would be impossible to keep school in the majority of our school rooms in the summer without opening the windows and allowing the air to pass through the rooms with perfect freedom."

This being the case, why keep the windows closed? Surely not because some theorist on ventilation insists upon it simply because he is trying to sell a system of ventilation that he claims will do the work in the summer equally well as in the winter.

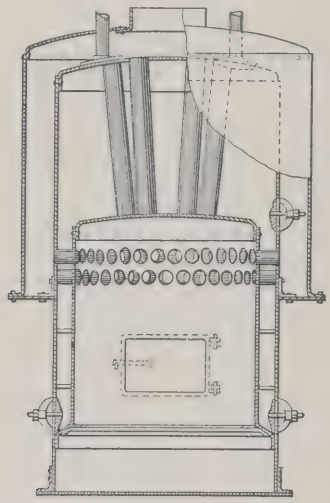
If heating and ventilating engineers will turn their attention to winter ventilation, and let summer ventilation take care of itself, it will then be time enough, when the problem of winter ventilation is solved, to take up summer ventilation, but the two do not work successfully under the same treatment.

In placing a gauge on boilers, it should be so connected as to take steam from a part which will be as free from vibrations of pressure as possible, that is, away from the outlet to the engine, and a siphon should never be omitted. It is also necessary that the gauge shall not be placed at or near the lower level of a connecting pipe which has a drop of any extent, which will create an excess of pressure on the dial by the weight of water in the column. In a battery of boilers there should be a gauge on each boiler and not one gauge for the whole.

NEW SPECIALTIES.

RANTON'S HOUSE HEATING BOILER.

The annexed engraving shows the construction of this boiler so clearly that but few words of description are necessary. Inclined tubes connect the crown sheet with the dome of the boiler, passing through the water space as shown, while a series of short horizontal tubes lead from the upper part of the fire box through the water leg to the smoke space surrounding the water space. The opening in the tube of the smoke hood is one half larger than the combined area of all the inclined tubes, so that the draft necessarily causes a portion of the gases of combustion to pass through the short horizontal tubes, thus giving the water space the

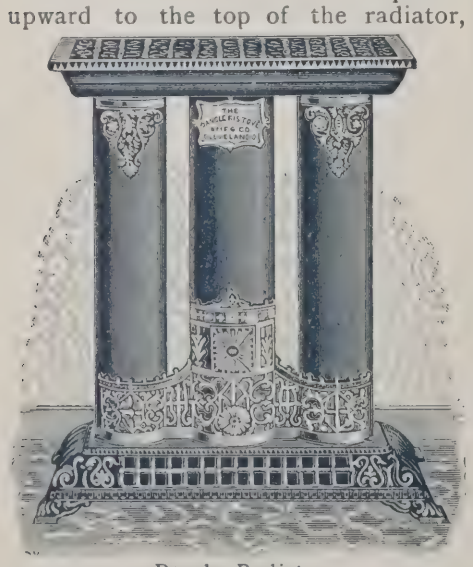


Ranton Boiler.

benefit not only of the fire box and inclined tubes but also of the heating space surrounding it. These boilers are said to be very economical, some of them being in use at the plants of the Standard Oil Co. at Gloversville, Oswego, Watertown, and Ogdensburg, N. Y. The Ranton Boiler Co., 309 Genesee street, Syracuse, N. Y., are the manufacturers.

DANGLER GAS RADIATOR.

In this radiator the heat generated in the central or burner tube passes upward to the top of the radiator,

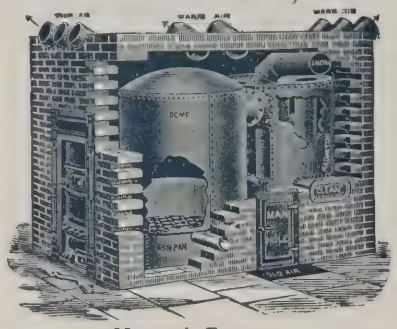


Dangler Radiator.

whence it passes downward through the side tubes and out into the room through the openings in the front of the base. By this arrangement the feet can be warmed as readily as with a base burner. This radiator thus differs materially from a construction in which the burner is at the bottom of the tube and the discharge at the top, and gives much better results. The Dangler Stove & Mfg. Co., Cleveland, O., are the manufacturers.

MONARCH ANNEALED STEEL WARM-AIR FURNACE.

The engraving shows the construction of this heater, which is

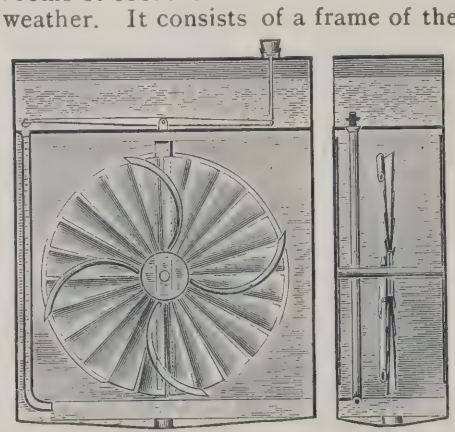


Monarch Furnace.

manufactured by Kruse & Dewenter of Indianapolis, Ind. It is constructed of riveted annealed steel plates, the combustion chamber being lined with fire clay tile. The grate is of the rotating type, and the check drafts are so arranged that they may be operated from a room upstairs without the necessity of going to the furnace. It has a reversible flue radiator, and burns anthracite or bituminous coal, coke, wood, or natural gas.

SHILLING'S NEW HUMIDIATOR.

The object of this device is to purify and moisten the air of artificially heated rooms or cool the air of of rooms in hot weather. It consists of a frame of the

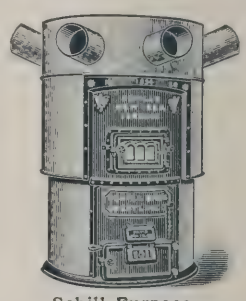


Shilling Humidiator.

construction shown in the cuts, containing two small tanks or reservoirs, one at the top and one at the bottom. A pipe from the upper reservoir leads to the lower one, the end being curved as shown. It will be seen that as the water in the lower reservoir rises and covers the end of the tube so that air cannot pass to the upper tank, the water will cease to flow, thus keeping the water in the lower reservoir at a constant level. A rotary fan in the frame is provided with four curved tubular arms so arranged that as the fan revolves, the upper end of each tube dips a small quantity of water from the reservoir, which flows into the center as the arms rise to a higher position with the revolution of the fan. This places a small quantity of water on the vanes of the fan, which is thrown out by centrifugal force as the fan revolves, thus moistening the air which passes through. The fan may be rotated either by the current of air forced through it, or by independent means. To guard against the possibility of the water in the upper tank flowing to the lower one when the upper one is open for refilling, a valve on the end of a lever closes the upper end of the tube when the cork which stops the opening through which the tank is filled is removed This device is the invention of Geo. Shilling and Chas. G. Smith of Washington, D. C.

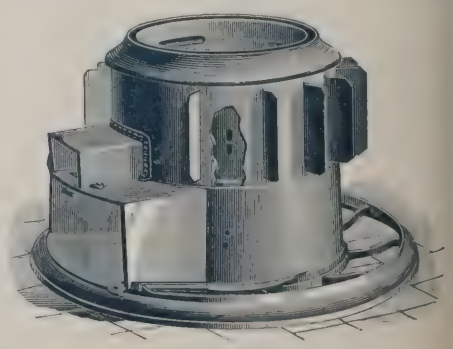
SCHILL'S NEW IDEA FURNACE.

The fire pot of the furnace shown in Fig. 2 is a double one, consisting of a heavy cast-iron inner pot with a series of openings near the center and large openings at the top. This inner pot is surrounded by a steel jacket, forming an air heating chamber, into which air is admitted and heated before entering the combustion chamber, thus securing perfect combustion. Soft coal or



Schill Furnace.

screenings may be successfully used as fuel, and as soon as the fire becomes covered so that the gases cannot burn through the mass of coal, they pass out of the lower openings in the fire pot into the air heating chamber, re-entering the fire pot through the large openings at the top and igniting the gases on top of the mass of fuel. By means of an opening and closing ring between the fire pot and the steel jacket the amount of over draft can be regulated, so as to take part over-draft and part of draft through grate, or as much at either place as may be desired. The grate is of novel construction and can be readily and quickly replaced. The heating drum consists of an inner and an outer steel plate drum connected by steel wings, drawing the two drums tightly together and forming air passages, which greatly increases the heating surface. It is constructed so that the entire surface from the bottom of ash pit to the top of the radiator is in a straight line, with no tubes, crooks,

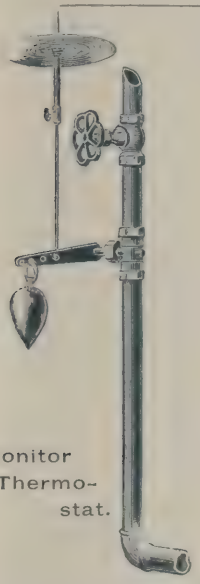


Schill Furnace.

or turns of any kind to prevent the free flow of large volumes of air. Schill Bros., Crestline, O, are the manufacturers.

THE MONITOR THERMOSTAT,

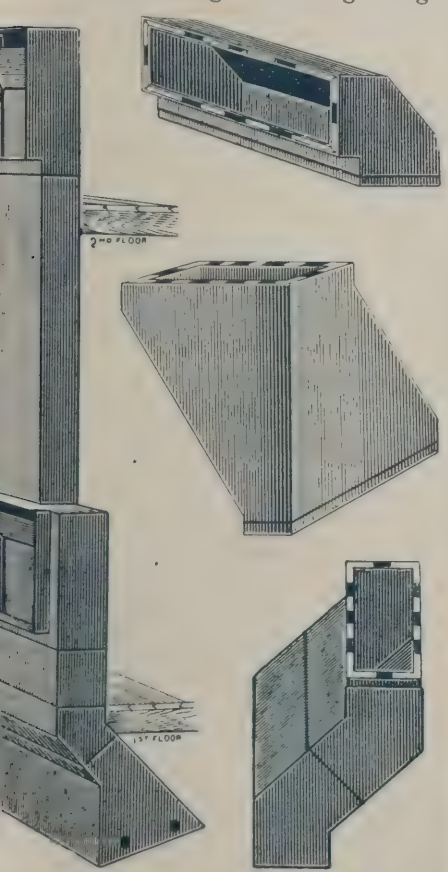
Shown by the accompanying cut in its application to the regulation of the supply of fuel gas, consists of a generator connected to an expander in the basement by a small lead pipe, which is placed inside of the partition, out of sight, or alongside the casings. The expander is connected to the check damper by a small rod. The check damper is opened or closed by pneumatic pressure, the pressure varying with the temperature of the rooms above. Any change in temperature is instantly transmitted to the check damper, to open or close it as the case may be. It is adapted for use on steam and hot water apparatus as well as furnaces. The Monitor Temperature Regulating Co , 89 Shelby street, Detroit, Mich., are the manufacturers.



Monitor Thermostat.

THE NOVELTY VENTILATED PIPE.

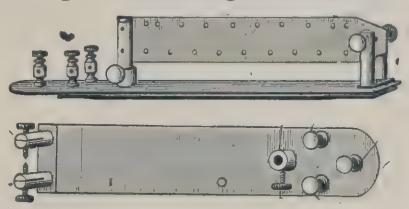
This pipe, which is manufactured by John P. Schaffer, 18 East street, Pittsburgh, Pa., is absolutely fireproof, made of the best bright tin by special machinery, and in lengths of from one inch to eight feet, the joints all being double seamed. The slip connection makes a perfectly tight joint, being fully one-half an inch in length. The right angle



elbows are made with an easy curve on the back and a sharp curve on the inside to allow passing around corners without coming into contact with the plaster at the ceiling. It is ventilated the entire length. A few of the different constructions are shown in the accompanying cuts.

THE BARNEY ADJUSTABLE THERMOSTAT

Consists of a sensitive combination blade, Fig. 1, supported upright by a brass post that has a pivoted end to fit into a brass socket post, through one side of which is a set screw, as shown in Fig. 2. This allows the operator to adjust the blade to the right or left at will and securely fasten it in its proper position. At the front end of the thermostat plate are two stationary upright contact posts, each having a working screw through it. Between

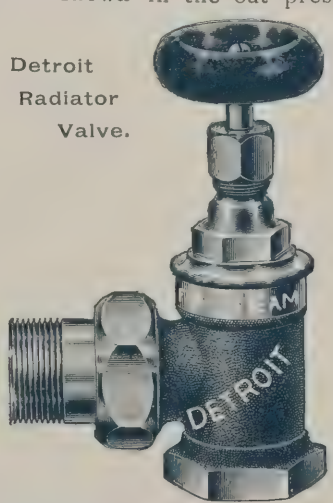


Barney Thermostat.—Figs. 1 and 2.

these two points the front end of the thermostat blade works. The three binding posts at the rear end of the thermostat plate are for battery or motor connections. When the contact point of the thermostat blade moves to the right or left it touches the point of the screw in the contact post, closing a circuit which releases the motor that works the damper, etc. E. Barney, Schenectady, N. Y., is the patentee and manufacturer.

DETROIT QUICK OPENING AND INTERLOCKING STEAM RADIATOR VALVE.

The quick opening valve for steam radiators shown in the cut presented



Detroit Radiator Valve.

herewith is simple in construction, and only the best material is used in its manufacture. A downward pressure on the handle and a turn to the right closes and securely locks the valve while a turn to the left and raising the handle opens the valve. All valves are furnished with asbestos stem packing, and Jenkins' disks are supplied whenever called for. This valve is manufactured by the Detroit Lubricator Co., Detroit, Mich.

THE OSTER ADJUSTABLE DIE STOCK.

The die stock shown in the accompanying cut will thread from four to six sizes of pipe, is self centering, and is instantly removable when the thread is finished, no turning back over threads being necessary. It has a patent adjustable positive stop, which enables the user to thread any number of pieces of pipe of a given size without resetting. The dies can be readily changed without the use of any tool, or removing any

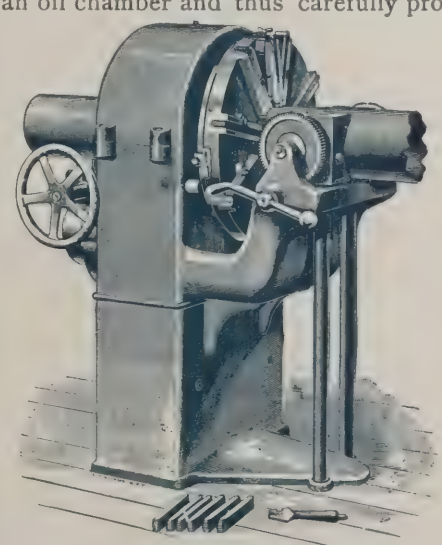


Oster Die Stock.

part of the machine. They can be sharpened on a grindstone without injury, and are accurately adjusted to the desired size without trial. Pipe can be threaded and cut off without a change of tools. The dies and guides are operated by a cam movement. The cams have suitable handles by means of which the operator can easily adjust them to any desired size without the use of other tools. The patent device for holding the cams in position while threading the pipe is warranted by the manufacturers, the Oster Mfg. Co., Cleveland, O., not to slip.

ARMSTRONG PIPE THREADING AND CUTTING-OFF MACHINE.

This machine, which is made in several sizes, will cut and thread pipe from one to six inches inclusive, and is operated by either hand or power; preferably the latter for the larger sizes. It weighs from 700 to 1,200 pounds, and is furnished complete with set of right hand dies and countershaft. Two very desirable points of excellence in this machine are its compactness and simplicity of construction. Every part is made for long and severe service. It works rapidly and with ease, and is so designed that when cutting off pipe, the dies are opened for the pipe to pass through without being removed from the machine. This is accomplished by a simple movement of the lever operating the cams. The gears and bearings are inclosed in an oil chamber and thus carefully pro-



Armstrong Pipe Machine.

tected from any chips or dirt which might otherwise get into the working parts. The Armstrong Mfg. Co., Bridgeport, Conn., are the manufacturers.

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ENTERPRISING and progressive as it has ever been our aim to be, nothing which we have yet attempted gives so comprehensive an idea of the possibilities of strictly high-class trade journalism as does the article which we publish this month on the subject of modern steam and hot water boilers. In it are embodied the results of the expenditure of much labor, time, and money, and we feel sure the article will be appreciated by the trade whose interests we earnestly endeavor to serve. The article shows the points of difference in the designs of the various heaters, and serves to illustrate as well as describe the salient features of construction. To manufacturer, dealer, and general reader alike the article will be of value as an index, to which he can always refer for information on the subject, thus obviating the necessity of examining a hundred catalogues and wading through an almost endless amount of matter not at all descriptive of the heaters. The prospective purchaser, who may have preconceived notions as to the way a heater should be made, will probably find what he wants, and will send in his order for that one which best pleases him. While an article of this character clearly presents all the prominent features of construction, our readers are referred for a greater elaboration of detail to our advertising columns, and to the catalogues of the various manufacturers.

ALMOST daily we are in receipt of letters from subscribers stating, without solicitation, their regard for our journal. We appreciate the support we are receiving, and thank all those who contribute to it. It will be our constant aim to improve, so that our readers will always be satisfied.

THE Plumbers' Trade Journal claims that the executive committee of the Master Plumbers met in Boston *before* the committee of Master Steam Fitters met, and decided on the date for their annual convention. That the facts in the case are altogether different no one knows better than our esteemed contemporary; and any change in the dates selected should be made by the Plumbers' association. That the Steam Fitters' Convention will be largely attended is certain, and several prominent heating engineers of Europe have announced their intention of being present.

ARCHITECTS who would be successful in heating and ventilating work, unless they are themselves expert in this line, should employ the services of a skilled engineer; one who not only can plan and lay out the whole work, but who thoroughly understands all the various heating specialties by the use of which effective work is best secured. The manufacture of heating appliances has become a large industry, a variety in all kinds of specialties being presented to the choice of the consumer. Speaking of this variety in the various heating specialties, one of our contemporaries recently remarked, "Intelligent men do not shut their eyes and draw from this variety, as in a lottery, any appliance that chance may dictate; but they acquaint themselves with the merits and demerits of each. The particular mechanism of different appliances claiming public favor, and the principles of their construction, constitute an interesting and profitable field of study, and in mastering them one can scarcely fail to become expert in nearly the entire theory of steam generation and its utilization either for power or heating."

"THE PRIMARY sources of information upon the subject of steam heating specialties are the printed descriptions of them in manufacturers' catalogues or trade circulars, or such descriptions of them as appear in the columns of trade papers. Of these, those published in the better class of trade papers are, as a rule, the most satisfactory. In too many catalogues the descriptions are not always clear enough to be easily understood, even by those already versed in principles and in the practical use of steam. Still less are they clearly comprehensible to a large class of steam fitters whose opportunities for gaining theoretical and practical knowledge have been limited by circumstance, yet who are obliged to resort to the use of such appliances in special cases."

TEMPERATURE regulation by means of thermostats, instead of by mixing-dampers operated by hand, seems to be coming into more general use. One serious defect in this method of control, however, is that in most cases the air admitted to the rooms changes alternately from hot to cold, the damper being either wide open or tightly closed. To avoid objectionable drafts under these circumstances it is necessary to have the temperature of the air in the cold-air duct but slightly less than that in the room to be heated. What is wanted is a thermostat which shall be progressive and not intermittent in its action.

REFERRING to the business policy pursued by Domestic Engineering, a Western plumbers' paper, with regard to its position in relation to the heating trade, the Master Steam Fitter, one of our esteemed contemporaries, says, "When the paper in question presumes to step out of its way, and instead of being a servant, aims to be a master, and to dictate to the Master Steam Fitters' Association a certain line of policy; to interfere with the work of organization as planned by the national officers; and still further to undertake to interfere with the selection of such officers, and further yet, to proclaim that no necessity existed for a separate organization composed of master steam fitters, it is time to call a "halt" and to inquire whether the sheet in question is actuated by an honest desire to further the interests of those whom it seeks to represent, or whether its line of action is dictated by purely selfish motives, whose mainspring is the advertising column and a desire to divert to themselves patronage which of right belongs to papers directly in the steam heating field. The master fitters of the country should know who are and who are not their friends, and should govern themselves accordingly."

LETTERS FROM PRACTICAL MEN.

Correspondence from practical men upon topics of interest relating to Heating, Ventilating, and kindred subjects, will find a place in this department. The editors, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

Air Supply for Furnaces.

While reading your editorial in the March number on the success in heating with hot air depending primarily upon the judgment of the furnace man, it struck me that much has been said about the proper position of the furnace, pipes, registers, etc., but very little has been said about the air supply for a furnace. In city houses, which are generally narrow and long, also closed in on both sides, the air supply is taken either from the front or back of the house, or, in almost one-third of the houses, it is taken from the cellar. The opening to the air ducts taken from the outside is generally at the cellar window, which is on an average from one to two feet below the level of the ground, hence the air we breathe in our city homes is taken from a stagnant atmospheric pool of baneful impurities which are destructive to health.

It is no fault of the furnace man that this state of things exists, for under the circumstances he does the best he can. It is the architect who is to blame, by not providing some means to have the opening at the proper point for the admission of pure air.

Provision is made for all other requirements in construction, but that which is most essential is looked on as least important. It would be better if the supply of air were taken from the house. The result would not be so disastrous to health, as the occupants of any city house are not so large in number as to vitiate the air. We owe a great deal to green lumber and bad workmanship for the fresh air we do get into our homes.

Mr. Jas. A. Harding has given us some valuable points on hot air heating for country houses. Perhaps at some future time he may be able to give us his experienes with city houses. MILLAR.

The Flue versus the Loop.

In the February issue of HEATING AND VENTILATION, under the above title, the writer notes certain exceptions that have been taken to several statements which he had made in a previous article, with regard to the relative efficiency of different styles of radiators. An honest difference of opinion is always entitled to a respectful and disinterested hearing, but the writer cannot but enter a protest at the manner in which these exceptions were taken, and the facts which were advanced as a basis of argument. If our correspondent "T. C. J." wishes to be understood as claiming that what he has written is an honest expression of his belief in this matter, I cannot but infer that he is ignorant of much which it will be essential for him to know before conducting a very able defense of the principles embodied in the construction of a flue radiator; and if, upon the other hand, we incline to the more charitable belief that he knows better than he has written, it is to be regretted that he has so expressed himself. In discussing any question upon which a difference of opinion exists it is essential that some standard of reference to which both parties agree shall be taken as a basis for comparison, and the comparative weight of each argument proved by its comparison with this standard. The scientific world has long sincerecognized and accepted certain laws govenring the diffusion of heat. They recognize the principle of the diffusion of heat by radiation, and also another principle of the diffusion of heat by convection. Our friend "T. C. J." advances boldly and declines to accept this standard. We shall, therefore, obviously be unable to argue the point with him. The restricted breadth and weak grasp which he has on this subject can be shown in no plainer way than by quoting a sentence from what he has written, and it will be left to the reader to decide whether or not such a unique theory of the diffusion of heat is to be accepted. He says, "It strikes me that heated rays are all, to a greater or less degree, convected or conveyed upward with a greater or less velocity;" and from the context one is led to believe that this summarily disposes of the whole matter. Any one gifted with the slightest curiosity, after hearing such a concise statement of his theory, cannot but wonder what becomes of all these rays that are heated, after they are conveyed upward, and if these rays that are conveyed upward are the same ones that will be conveyed downward later when the conditions are favorable. It would seem that the fact which has made our friend skeptical with regard to radiant and convected heat is his inability to understand what would become of his radiant heat in the case of an indirect radiator. We always supposed that radiant heat had no particular respect or liking for any one particular location, and that where the proper conditions existed, it was to be found as truly in an indirect radiator as in any other place. Perhaps our friend's difficulty, on a basis of his own theory, lies in wondering whether the heated rays which are "conveyed upward with a greater or less velocity," would not be caught on the frel work of the register but we assure him that this is not so.

The exception taken to the writer's statement that one-third of all the heat given off by a direct radiator is given off as radiant heat, seemed to be the particular point to which an objection was made; but he would state in continuation of this matter, that this result was deduced from a number of experiments on direct radiation, conducted by several engineers of acknowledged merit, and that these results have been published. The names of the engineers, the styles of the radiators, the results of the experiments, the date of the experiments, and the name of the publication and its author, are all a matter of available reference, and could be given by the writer should the occasion seem to demand it.

After the acknowledgment of "T. C. J." that he does not recognize any such thing as radiant heat, it is rather pressing the matter when he announces that he concurs heartily in a previous statement to the effect that all surface possible should be so arranged as to permit the freest radiation; he continues by saying, that the writer was evidently ignorant of a very important fact, i.e., in the tests referred to, the vertical flue was the only radiator that fully met the conditions. I most certainly was ignorant of this fact, or I should not have quoted these tests as an argument to the point which I had originally wished to demonstrate. So far as the protest being entered against the validity of these tests because of their being conducted in midsummer, I can see no justice in the demand. Inasmuch as I firmly believe that the natural laws governing the working of a radiator, work as truly in the summer time as in the winter, and that inasmuch as both constructions were subjected to the same disadvantages, there can surely be no reasonable protest entered on this account. The tests were made by Charles E. Emery, a man with whom the writer has not the pleasure of a personal acquaintance, but who has an enviable reputation as an engineer, and one whose statement is considered an authority, especially in questions of this kind; and it will surely be very difficult to cause any extensive belief, that in conducting these tests he neglected to take any precautions which his extensive experience could suggest to render these results as correct as possible. Would it be considered out of order if we should ask who Mr. L. M. Hunter of Titusville, Pa., is: and for what reasons a precedence should be given to his experiments over those of Mr. Emery?

The writer would not wish to be understood as claiming that there is no value to be found in a flue radiator. There is, but not entirely for the reasons that our friend advances. To say that a direct radiator is a good direct radiator because it is a good indirect radiator, is not a particularly strong argument, although this is the basis on which all of its claims to superiority must stand. The flue radiator is finding a place in the market; that there is a demand for it there can be no question, but this much must be said, that where the demand exists with an equal price with other forms of radiation, it shows a lack of knowledge of the principles involved on the part of the buyer. Where a demand exists with the price in favor of the flue surface, as is undoubtedly more often the case, then there is no mystery about the demand. I say undoubtedly, in the above, advisedly, as any one by reference to the lately published quotation sheet of the largest radiator concern in the country can see at a glance just what value the flue surface has in the market. This concern also point another moral in the matter of this flue surface on their quotation sheet. It will be noticed that they do not manufacture their new Detroit flue radiator in anything over the 20-inch height. This shows a correct recognition of the flue principle, and that they are estimating this surface at its true value. They quote a foot of this surface in a 20-inch height at 23 cents; on their 20-inch heights of other makes not embodying this principle, they quote 29 cents and 30 cents, a reduction on the flue surface corresponding very nearly to their one-third loss in efficiency due to the flue construction. If they did not recognize that this surface was not as valuable, or, in other words, if they considered it equal to other surface of their make, why should they not be prepared to sell it at the same price? The fact that New York architects and engineers are using this radiator is or is not an argument in favor of the principles of the radiator, according as one's opinion of the discrimination and judgment of New York architects and engineers in this matter is or is not of the highest quality.

I would remind my friend that I am not objecting to his making a defense for the flue surface, and I believe that in such defense as he has made he knows better than he has stated; but would it be too much to ask, in case it may occur to him to bring forward this subject again for discussion, that he secure in any argument which he may bring forth some semblance of his recognition and knowledge of the principles which are universally accepted as governing the diffusion of heat. KNIGHT.

Designing Boilers.

[The following letter was received by a gentleman in St. Paul, Minn., in reply to a letter he wrote to Mr. Hopkins, the inventor of the Electric boiler, asking for a criticism upon a new design of boiler. The criticisms cover points in boiler construction which are now attracting considerable attention, and will no doubt be of interest to our readers.]

There are two main points to be always considered in designing a heater of any kind, the most important of which is combustion. The very best steam and hot water heaters on the market to-day are not utilizing more than 30 per cent of the theoretical heat units in coal, and not more than 50 per cent of the practical heat units, i.e., that which it is possible to utilize were the laws governing the combustion of fuel, the liberation of heat units, and their absorption or transmission into other bodies properly complied with.

The gases liberated from coal during the initial process of combustion contain 75 per cent of the theoretical heat of coal; of this there is seldom more than 10 per cent and never more than 25 per cent utilized in practice.

The principal cause of this lack of utilization is to be found in the fact that all inventors aim to concentrate the greatest possible amount of heat absorbing surfaces (in proportion to grate surface) in the smallest possible floor space, with the result that there is practically no space left for the expansion of the gases. Since the combustion of the gases cannot occur unless they expand several times their bulk (when first liberated from the coal), it follows that any heater in which large amounts of heating surface are

massed together, without proper arrangements being made for the expansion of the gases, cannot prove economical. This is especially true of any boiler that takes the draft directly from the top. For the reason that all the gases liberated or produced in the initial consumption of coal are very light (except carbonic acid gas), they rise rapidly, and if affected at all by the heat below, and combustion started, the expansion which takes place drives the gases into the flue directly, where all the best is irrevocably lost. As illustrating the immense expansion of gases when burning, I recall to your mind what you have doubtless often observed, i.e., the tremendous explosions that occur when there is an accumulation of gas in a heater of any description; a door being opened into the heater, the pent-up gases having a chance to expand, do so with a violent explosion, when they immediately flash into flame and a semi-combustion of the gases occurs.

It was with a thorough knowledge of the above principles that I designed the Electric boiler, providing a combustion chamber at the top of the boiler where the light volatile gases, after rising to the top, would be held in suspension for a moment and ignited from the heat below; they would pass, still burning, in their downward passage through the rear tubes, giving up to the water the heat units thus released as they pass toward their exit.

And still, as I say, with a thorough knowledge of the principles involved, I was controlled too much by precedent, and did not allow sufficient space to get the best results. Yet the results obtained with the first constructions are such that I challenge comparison with the very best.

While I honestly believe that I have the most effective and most economical boiler yet produced, it is my opinion that much greater advances can be made; and while some other may be destined to achieve the fullest possible measure of success, I believe that within a few weeks I will be able to present to the trade a standard of success that will not be surpassed for many years to come.

In regard to the drawing of the boiler which you sent, you will see by the above that I consider it defective in its provisions for combustion. It would undoubtedly prove as satisfactory as nine-tenths of the heaters on the market, but no more so. The limit of cheapness has, in my opinion not only been reached, but *overdone*. The goal toward which we should strive is excellence, is *perfection*. If one has *the best*, all those whose trade is worth having will quickly find it out, whether it be cheap or not; but if one has only the cheapest, his success will be as transient as the brilliancy of a shooting star.

I believe that the interest which we both take in these matters goes much farther than mere personal success, and for that reason I most heartily wish to continue the correspondence and will be pleased to hear from you at any time. C. S. HOPKINS.

NEWS AND NOTES.

Large Buildings.

Worcester, Mass.—A new building will be erected for the Old Ladies' Home on Leicester street. C. C. Houghton will erect a brick block from plans of Barker & Nourse. Earl & Fisher are making plans for a handsome dwelling to be built on Claremont street for John Legg, superintendent of the Worcester Woolen Co., and they are also making plans for a block of stores and apartments to be built on Main street for O. C. Ward. Jas. L. Harrison will build a block of stores and apartments on Chandler street, near Piedmont.

Pittsburg, Pa.—Dr. J. F. Shafer has taken out a permit for erecting a brick dwelling to cost $15,000 on S. Negley avenue near 5th street.

Cambridge, Mass.—Wm. G. McLead of Cambridge will erect an apartment house on Hancock street, to contain 84 rooms. A separate heating apparatus will be provided for each of the twelve suites of apartments.

Baltimore, Md.—A building permit has been issued to Joseph Yeatman to build eight dwellings on Druid Hill avenue and eight dwellings on Francis street.

Attleboro, Mass.—The town meeting has appropriated $350 for steam heating apparatus for public buildings.

Brooklyn, N. Y.—Mrs. Francis Prahar of 2 Willow Place will erect brick flats at Willow street and Poplar Place, to cost $15,000. Wm. Baker of 228 South 5th street will erect three brick flats on South 2d street near Berry, to cost $24,000.

Pittsburg, Pa.—Mrs. Isabelle Ross has taken out a permit for a $21,000 brick warehouse on Liberty street, in the Fourth Ward.

Buffalo, N. Y.—The construction of the D. S. Morgan Memorial building, to be erected by the Morgan estate at the S. W. corner of Niagara and Pearl streets, to be fourteen stories high, as per plans of Green & Wickes of Buffalo will soon be commenced.

Hinsdale, N. H.—Architect Fuller of Worcester, Mass., has made plans for the proposed new town hall.

Sylvania, Ga.—A brick jail will be built for Screven County. County Commissioner, J. O. A. Ennis, and J. A. Enneis.

Providence, R. I.—J. Edward Studley, manager of the Wm. H. Lowe Estate Co., states that the building operations will be commenced about July 1st, on their proposed five-story business building at Peck, Orange, and Weybosset streets.

Erie, Pa.—Architect Frank has furnished plans for a fine two-story brick business block, to be built by A. Meyer on Parade street, and for the new Siegel block to be located on State street, near Eleventh.

Wilmington, Del.—The Wilmington Star is authority for the statement that Edgar Zielen will build twenty-four houses on the block of land bounded by Delaware avenue, Union street, and Gilpin avenue.

West Randolph, Vt.—E. P. Libbey of West Randolph has the contract to build a handsome block for G. A. Hall on College street.

Philadelphia, Pa.—Daniel Leamy will build seven dwellings on Ameseake street near 51st street; address him 3625 Walnut street. Chas. B. Prettman of 502 Betz building will erect 104 dwellings on Rosewood, Carlisle, and other streets.

Washington, D. C.—Plans have been made by Architect M. T. Haller for seven stone and brick dwellings which he will build for himself on Riggs street, between 16th and 17th streets.

Franklin, Ga.—Plans and specifications are asked for a $15,000 court house. Address R. T. McCutcheon.

Homersville, Ga.—Plans have been made by Bryan & Denny of Atlanta for the erection of a $20,000 court house.

St. Louis, Mo.—The Sister of Mercy in charge of St. Ann's Orphan asylum at 10th and Biddle streets, will remove to Page and Union streets, to erect there a $200,000 building, plans not yet drawn.

Pittsfield, Ill.—A $45,000 court house will be erected here. V. A. Grimes, county clerk.

Pittsburgh, Pa.—D. T. Watson has taken out a building permit for a $300,000 dwelling to be built on Smithfield street between Sixth and Seventh avenues, and George H. Dauler, Sr. will build a dwelling near there to cost $18,000. The Sister of Mercy have taken out a permit for a brick and stone addition to their hospital on Locust street to cost $35,000.

Baltimore, Md.—W. J. Clendinen has been granted permission to build nine three-story brick dwellings on Broadway near Townsend street. Building permits have been issued to John H. Diven for twenty two-story houses on Friendsbury Place, and to Chas. A. Lipp for sixteen two-story buildings on Cross street near Scott street, and to Wm. H. Herbst for three three-story buildings on Eutaw Place.

Newberry, Mich.—The board of control has employed Architects Charlton & Gilbert of Nester block, Marquette, Mich., to make plans for the proposed $75,000 insane asylum to be built at Newberry by the state of Michigan. Claude M. Case of the Newberry Furnace Co., at Newberry, is secretary of the building committee.

Rochester, N. Y.—Plans of architect Herbert W. Pierce have been accepted for the proposed $37,000 central police station on Exchange street.

Detroit, Mich.—Henry W. Halcomb of 277 Merrick avenue will build an $18,000 flat on Merrick avenue near Seventh street, and a $45 000 apartment house on Merrick avenue near Greenwood

New Haven, Conn.—The contract for building the new Yale law school and dormitory and recitation rooms has been awarded to Kirk & Jacobs of Newark, N. J., at $105,000.

Goffstown, N. H.—The commissioners of Hillsboro county have selected the plans of Howard & Caldwell of New York, their estimated cost is $145,000 for the proposed new county buildings at Goffstown.

Bellevue, Ohio.—Peter Brady has received plans and specifications for a $20,000 theatre and city hall.

Brooklyn, N. Y.—Joseph Fahys at Clinton and DeKalb avenues will build four brick dwellings to cost $32,000 at said point. Henry B. Hill of 193 Ralph avenue will build eight brick dwellings on Bainbridge street near Howard avenue, to cost $30,4-0.

Hopkinsville, Ky.—The board of commissioners of the Western Kentucky Asylum for the Insane, invite plans and specifications for a $65,000 addition to the building. S. G. Buckner, chairman of the building committee, Hopkinsville, Ky.

Worcester, Mass.—The State Mutual Life Insurance Co. will erect a $600,000 block at Maine and Maple streets.

Boston, Mass —Fred H. Curtis of the Broadway National Bank will erect a $30,000 dwelling on the Bay State road, from plans of M. F. Wakefield.

Baraboo, Wis.—The Sauk county board of supervisors have appropriated $35,000 for furnishing and heating the addition to the county asylum.

Washington, D. C.—Architect I. G. Hill has made plans for the proposed $35,000 dwelling for Senator Quay on "K" street, to have electric light and all modern improvements.

Montreal, Canada.—The Y. W. C. A. at 101 Metcalfe street will erect a $60,000 edifice from plans of architect A. C. Hutchinson. Miss H. E. Tenney is secretary.

Brooklyn, N. Y.—P. Thompson of 76 Broadway, New York, will erect six dwellings on Bergen street near Rochester avenue; $24,000. John Caulfield of Hamilton avenue near Henry street, will build four brick tenements on the N. W. corner of Henry and Huntington streets, to cost $28,000. Fred Loeser & Co. of Fulton place and Livingstonstreet will build a $40,000 brick addition to their store. The German American Improvement Co. will build twelve dwellings on Doscher street near Eastern Parkway. C. A. & E. S. Betts of 1292 Fulton street will build three brick dwellings on the S. W. corner of Fulton street and Nostrand avenue.

St. Louis, Mo.—The Granite Building at Fourth and Market streets will be remodelled at a cost of $70,000, from plans of Isaiah H. Taylor of 520 Olive street.

Billerica, Mass.—It has been decided to appropriate $700 for plans for a $25,000 town hall for Billerica.

Waugekan, Ill.—The board of supervisors is looking over plans for a new jail to cost about $30,000.

Economowoc, Wis.—Dr. J. H. Voise will enlarge his sanitarium by a $20,000 addition.

Buffalo, N. Y.—Bids are being taken for the reconstruction of the Lehigh Valley building at Main and Seneca streets, owned by M. H. Birge of Birge & Sons.

New Haven, Conn.—New headquarters for the New Haven mission will be erected at once to cost $45,000.

Cumberland, R. I.—Cumberland voters have decided to build a $10,000 Town House at Broad and Titus street.

Stratford, Conn.—A $30,000 library will be built for Stratford, from plans of A. L. Miller of Ithaca, N. Y., with funds, the gift of Birdseye Blakeman of Ivison, Blakeman & Co., of New York, and the building contract has been awarded to the St. Lawrence Marble Co. of St. Lawrence.

Buffalo, N Y.—Architects Metzger and Greenfield are making plans for a $35,000 flat to be built for P. E. Stanton at Porter and West avenues, to be three stories high

Washington, D. C.—Architect Wm. J. Palmer is completing plans for a handsome Home for Naval Lodge No. 4 of Masons, to be built at Penn avenue and Fourth street and to cost $35,000. F. E. Carmody has the contract to build for H. Bradley Davidson five three-story dwellings from plans of George S. Cooper, to be located at 31st and "O" streets.

Memphis, Tenn.—The Memphis Opera House will be remodeled at a cost of $15,000, and electric elevators will be put in. W. D. Bethell will give details.

Philadelphia, Pa.—Plans are now being made for the proposed $100,000 hospital ward for U. of P. Hospital, to be a memorial to Dr. D. Hayes Agnew. Frank Hoppe of Second and McKean streets has taken out a building permit for seven three-story dwellings to be built on Fifth street near Moore, and two dwellings adjoining.

New Haven, Conn.—Work will be begun in two weeks for the proposed new building of Tuttle, Morehouse & Taylor on Temple and Crown streets. Cost, $50,000.

Brooklyn, N. Y—John Dunn of 64 Amity street will build four brick dwellings on Henry street near Sackett to cost $26,000.

Boston, Mass.—A $40,000 wing will be added to the Barnum museum at Tufts College.

Cumberland, R. I.—It is proposed to issue bonds to the amount of $40,000 to build a town hall.

New York, N. Y.—Frank Tilford of 119 W. 72d street will build a $50,000 dwelling at 245 West 72d street from plans of Lamb & Rick.

East St. Louis, Ill.—J. T. McCasland has offered a site on Eighth street of which directors of the Library Association will erect a $40,000 building.

Detroit, Mich.—M. L. Smith & Sons of 56 Campau building are architects for the $200,000 bank and lodge building to be built for Iesse H. Farewell and Frank E. Bamlet at Grand River avenue and Rowland streets.

Buffalo, N. Y.—Edward C. Baynes has taken out a building permit for a three-story brick building to be occupied as stores and flats to be built at the S. W. corner of Delavan and Emily streets and to cost $20,000.

Baltimore, Md.—J. J. Willis has taken out a building permit for ten three-story dwellings to be built on Biddle street near Guilford avenue.

Binghamton, N. Y.—G. O. Garnsey of 185 Dearborn street, Chicago, Ill., is the architect for the proposed Commercial Travelers' Home to cost $111,000 and to be located at Binghamton. D. K. Clink of 220 Adams street, Chicago, Ill., is one of the committee.

Detroit, Mich —Mortimor L. Smith is making plans for a ten-story steel frame building to be built at Rowland street and Grand River avenue for Jesse H. Farewell and Frank H. Bamlett.

Brooklyn, N. Y.—M. Murphy of 1 Hamilton avenue has taken out a building permit for a store and hotel to be built at the S. E. corner of High and Liberty streets, to cost $50,000. William H. Reynolds of Fulton and Washington streets will build six brick dwellings on Park Place near Underhill avenue to cost $25,000.

Churches.

Homestead, Pa.—The Christian congregation will erect a $13,000 church at Ninth avenue and Dickson street. The Primitive Methodist congregation will erect a church. The Hebrew congregation, of which Jas. Seigleman is president, are organizing and will build a synagogue.

Philadelphia, Pa.—The German Catholics will erect a church at 43rd and Wallace streets, to cost $32,000.

Brooklyn, N. Y.—The R. C. church of Our Lady of Mercy will spend $15,000 on alterations to their edifice.

New York, N. Y.—A handsome new building will be erected for Grace M. E. Church on 104th street between Columbus and Amsterdam avenues.

Brooklyn, N. Y.—Bushwick avenue Congregationalists will soon have work under way on their $35,000 edifice at corner of Bushwick avenue and Cornelia street. Rev. W. T. Stokes, Pastor.

Trenton, N. J.—Green street M. E. church will erect a $50,000 edifice. Building committee has specifications.

Washington, D. C.—The vestry of St. Andrews P. E. church at the corner of 14th and Corcoran streets have accepted the design for the proposed new church edifice prepared by Archs. C. W. Murdoch and C. L. Harding.

Quincy, Mass.- Ground has been broken for a M. E. Church. Rev. H. D. Deetz is pastor.

Brooklyn, N. Y.—The trustees of the New England Congregational Church have decided to rebuild their church on South Ninth street

Blythebourne, N. Y.—Work will soon be commenced on the M. E. church to be erected at 11th avenue and 56th street.

Jamestown, N. Y.—Sealed proposals will be received until May 1st by John Guenster, Secretary Building Committee, Jamestown, for the erection of St. Peter's and Paul's church on Cherry street.

Pittston, Pa.—S. S. Patterson of Wilkesbarre, Pa., has contracted for an addition to St. Casimir's Church at Pittston, on Butler and Ewen streets. Steam heating apparatus will be placed in the addition when completed.

Roxbury, Mass.—The Roxbury Universalists Church Society proposes to build a $75,000 stone edifice on Buena Vista avenue.

Baltimore, Md.—Appold Methodist Church at Chase and Washington streets, has decided to build a new edifice from plans of Owens & Bieler to cost $20,000. B F. Bennett is the contractor.

Erie, Pa.—Constable Bros. of Erie, have contract to build a Catholic Church in Lucinda in Clarion County, to cost $30,000.

Erie, Pa.—The Congregation of the Sacred Heart will erect a new edifice at 26th and Plum streets this summer. Architect Frank has made the plans for the proposed edifice for Polish Catholics to be erected at 13th and Ash streets.

Brooklyn, N. Y.—The Berean Baptist Society has bought site on Bergen street near Rochester avenue. Treasurer Morton or the Pastor Rev. L. Joseph Brown, will give details.

Wilmington, Del.—Ground has been broken for the proposed new Cookman M. E. Church at 14th and Dupont streets.

Chester, Pa.—Third Presbyterian Church will erect a new edifice for which $15,000 has been raised.

Dorchester, Mass —The Grave Hall Universalist Church Society, will build a $35,000 church now at Wilder and Washington streets. Rev. C. R. Tenney is pastor.

Mills and Factories.

East Cambridge, Mass.—A three-story brick building will be built at First and Otis streets, East Cambridge, Mass., to be occupied by Irving & Casson.

Canterbury, N. H.—The steam mill of J. H. Moody & Sons, which was recently burned, will be rebuilt.

Milwaukee, Wis.—The Western Paving & Supply Co. will erect a $40,000 factory on Commerce street near Holton.

Detroit, Mich.—Goebel Brewing Co. of 351 Rivard street will erect a $65,000 brick brewery, from plans of Brede & Mueller of 39 Kanter building, to include boilers, elevator, electric light, steam heat, etc.

Lafayette, Ind.—The Louisville, New Albany & Chicago R. R. Co. will build machine shops to cost $500,000.

Perth Amboy, N. J.—Hugh Ramsay will soon erect an immense iron and steel ship-building plant at Perth Amboy, with machine shop, boiler house, blacksmith shop, office, plate and angle shop, paint shop, and carpenter shop. Plans for these buildings are now in hands of contractors for bids.

Philadelphia, Pa.—Architect J. Franklin Stickert of 49 North Thirteenth street has made plans for a massive mill building, to be erected for Rumpf & Brothers at Hancock and Huntington streets, to replace that recently burned.

Louisville, Ky.—C. Lindsay, of 172 Main street, Zanesville, Ohio, has made plans and specifications for a large cracker bakery, to be built for the U. S. Baking Co. to include steam heat, boilers, elevators, and engines.

Pottstown, Pa.—The directors of the Bannockburn Mills have adopted plans for the necessary buildings, and will receive bids for their erection.

Scranton, Pa.—Business men have subscribed $20,000 as an inducement to the Susquehanna Steam Heater Co., to locate their plant at Scranton instead of rebuilding at Susquehanna, where their works were recently burned.

Philadelphia, Pa.—Wm.R. Dougherty has taken out a building permit for a $65,000 enlargement of the Ketterlinus Printing Establishment on Fourth street above Arch.

Huntington, Mass.—Henry E. Stanton of Huntington will build a large steam mill in Huntington.

Warren, Ohio.—The Warren Hardware Co., will erect a five-story brick building for the manufacture of range.

Carbondale, Pa.—C. E. Spencer, A. P. Trautwein and P. A. Carroll of the Board of Trade, are the Committee of the Board of Trade in the matter of the steam heating plant which proposes to locate in Carbondale.

Detroit, Mich.—Howard Northwood Malt Mfg. Co., of 1105 Grand River avenue, will build a two-story mill on Grand River avenue, including boilers, engines, and grain mill machinery.

Lestershire, N. Y.—The Faatz Brush and Felting Co. will erect a three-story brick building, from plans of F. L. Faatz, and they want estimates on belting, one 80 horse-power boiler, elevators, roofing and a 60 horse-power engine.

Dunning, Ill.—Arthur G. Morey of 0122 Chicago Opera House, Chicago, Ill., has made plans for a laundry building for the Dunning Insane Asylum, to be of brick, 82 by 100.

Chester, Pa.—Editor Thos. H. Higgins has accepted the plans of Walters & Plack of Philadelphia, Pa., for the proposed new building of the Delaware County Republican, to be located on Edgmont and Sixth street, three stories high, and to contain all modern improvements.

Glen Falls, N. Y.—A. S. Rugg of Glen Falls, N. Y., whose shirt and collar factory was recently burned, states that he will rebuild on the site of the old factory in the near future.

Pittsburg, Pa.—The S. W. Smith Wooden Ware Co., states that Chas. Bickel is the architect for their proposed 8 or 9-story brick factory, that it will be built some time this year, and that no contracts have yet been awarded.

Albany, N. Y.—Governor Flower has signed the bill appropriating $33,466 for a new boiler house and for other improvements at Clinton Prison.

Cambridge, Ohio.—Fleming & Gerkee will locate a new steam laundry on the South Side.

Cincinnati, Ohio.—A new laundry will be located at Jackson and 13th streets by S. W. Waters of the White Star Laundry Co.

Stamford, Conn.—Gillespie Bros. will build a four-story brick and iron building as per plans of J. S. Bogardus of Stamford. Building contract has not been awarded. They want estimates.

New Bedford, Mass.—Architect Slack is making plans for improvements to the County Buildings, including a new steam plant and boilers for the House of Correction.

Schools and Colleges.

Wilkes-Barre, Pa.—Four rooms are to be added to the Moyallen street school, and citizens are agitating the question of erecting two more new school buildings.

New York, N. Y.—Barnard College, Rev. Dr. Brooks, chairman of board of trustees, is to be enlarged at a cost of $100,000.

Indianapolis, Ind.—Sealed proposals will be received until May 1st for the erection of a two story and basement University Building. Plans and specifications may be seen at the office of Parker & Jeckerl, architects, Anderson, Ind. S. R. Lyons, Secretary.

New Castle Pa.—A new school will be erected on the east side. Address Superintendent Shearer for details.

Wilkes-Barre, Pa.—The contract for the proposed $90,000 addition to the Hallinkrodt Convent has been awarded to Hull & Sherred of Wilkes-Barre.

Greenville, Ill.—The Greenville School Board is investigating into the matter of the most improved methods of heating for the public school.

Worcester, Mass.—The Committee on Education has asked for $150,000 for sites and buildings for new schools.

Mount Vernon, N. Y.—The Board of Education will ask Common Council to place before taxpayers the matter of issuing $100,000 in bonds for new schools and $15,000 in bonds for building for the Board of Education offices, library, etc.

Gilman, Ill.—A six-room brick school house, heated by indirect steam, will be built here. A. J. DeLong, president of the board.

Rochester, N. Y.—The work for the Board of Education for the coming year includes a new 18-room school to replace No. 17 on Orange strett, a ten-room school on Conkey avenue, a new school on Field street lot, and an addition of four rooms to No. 31 on Culver Park, and kindergarten additions to Nos. 14 and 6.

Milwaukee, Wis.—The Finance Committee has recommended $35,000 issued for school house on the west side.

Oregon, Ill.—McMurray & Davis of Chicago, Ill., have made plans for a $20,000 school house.

Andover, Mass.—The trustees of Phillips Academy have awarded a contract to Hardy & Cole for a 32-room addition to the Mansion House, as per plans of Longfellow, Alden & Harlow, of Boston.

Hardenburgh, N. Y.—District No. 3 of Hardenburgh will build a fine new school house.

Buffalo, N. Y.—Competitive plans will be received by the Board of Public Works for a school building, to be erected at Hertel avenue and Guernsey street. John E. Ranson, Secretary D. P. W.

Scranton, Pa.—The building committee of the Board of Control have accepted the plans of architect F. L. Walter for a new 12-room school building at North Park.

Reading, Pa.—John Flynn of Columbus, O., is making plans for the new convent of the House of the Good Shepherd, to be built north of Kissinger's Bridge in Bern township, to be four stories high with four wings.

St. Louis, Mo.—Louis Wessbecker of 408 Temple Building, is architect for the $100,000 parsonage and school to be built on Eighth street near Howard. The Rev. X. Grielenshi of Eighth and Mound streets is pastor.

Schuyler, Neb.—The Schuyler Board of Education will build a $21,000 school from plans of Bell & Kent of 404 Sapp Block.

Charles City, Iowa.—The school board has bought a site for a $40,000 school building.

Delevan, Wis.—Plans nave been made by W. A. Holbrook of Milwakee for a $27,500 school house to be built at Delevan.

Gouverneur, N. Y.—Sealed proposals are asked for by the Board of Education for the proposed school, as per plans of architect Wood of Ithaca, now in office of Geo. E. Pike, First National Bank.

Mannington, W. Va.—The Board of Education of Mannington will build a 12-room school from plans of Franzheim & Geiser of Wheeling, W. Va.

Hadley, Mass.—Plans for the proposed new school for Hadley may be seen at the office of H S. Shipman at Hadley, Mass., and office of Chas. E. Park, 5 Park street, Boston, Mass.

Niagara Falls, N. Y.—A new $25,000 school house will be erected in Echota district.

Canterbury, N. H.—Three new school houses are to be built here during the coming season.

Philadelphia, Pa.—M. McManus has the contract for the erection of a three-story addition to Chandlier Public School.

New York, N. Y.—A new school house to be built at 87th street and West End avenue is to cost $173,000.

Hadley, Mass.—A new brick school house will be erected here. Horace Cook, chairman Building Committee.

Dedham, Mass.—There is a movement on foot to erect a new school house at East Dedham. H. W. Chapin, Thos. P. Murray, Alfred Hewins and others have been appointed a committee to secure plans.

Buffalo, N. Y.—The Board of Education has recommended the erection of three new school houses, plans for which will be secured at once.

Harrisburg, Pa.—A new $20,000 school house is to be erected here. Address Dr. G. G. Bailey.

Rushville, Ill.—A new high school building will be erected here. D. H. Glass, clerk of board.

Manchester, N. H.—The contract for the erection of the McGregorville school house has been awarded to the Head & Dowst Co. Bids will soon be called for the new Wilson school house to be built here.

Northampton, Mass.—The school commitee has instructed the city property committee in consultation with the school committee, to procure plans for a high school, to be finished in time for the fall season of 1895.

Hillbrook, N. Y.—Samuel Thorne will build a $75,000 union free school.

Detroit, Mich.—Malcolmson & Higginbotham of 53 Moffatt building, Detroit, Mich., are making plans for the proposed $30,000 school, to be located at St. Aubin street and Alexandria avenue.

Elmira, N. Y.—A two-story brick school will be built here, according to the plans of Pierce & Bickford, of Elmira, N. Y. E. J. Beardsley, secretary of the board of education.

Cincinnati, O.—H. E. Siter is making plans for a $35,000 school to be built on St. Gregory avenue.

Bayonne, N. J.—$35,000 worth of bonds have been issued for the erection of a new school house to take the place of School No. 3. Address Patrolman Elijah Russell.

Reading, Pa.—A 40,000 girls' high school building is to be erected. S. B. Ancona, chairman of building committee.

Harrisburg, Pa.—The contract for the erection of the Industrial school at Scotland, Pa., has been awarded to A. Burge & Son, Lancaster, at $76,986.

Wheeling, W. Va.—The committee on building and grounds of the board of education has been authorized to tear down the old Webster building, and erect a new building on site.

Winslow, Me.—It has been decided to build two new schools this summer. J. M. Taylor and Alden Bassett of the school committee will give details.

Portland, Me.—Superintendent of Schools Holland states that ventilating apparatus is needed for the basement of the Casco street school.

Genesee, N. Y.—A new school house is to be erected at Bergen to replace one recently destroyed by fire. Address A. G. Holdridge, Bergen, N. Y.

Brooklyn, N. Y.—St. Benedict R. C. Church will erect a $30,000 parochial school on Fulton street.

Rochester, N. Y.—$35,000 will be raised for a new school to replace the present No. 17 school at Orange and Saxton streets.

Northampton, Mass.—Ground will be broken this week for the dormitory at Smith College, Northampton, Mass., from plans of Wm. C. Brockelsby of Hartford, Conn.

Detroit, Mich.—Board of education has directed its secretary to prepare advertisement soliciting proposals to furnish the heating and ventilating apparatus, water closets, urinals, wash stands, etc., for two 12-room and several smaller schools. Information from architects Malcolmson & Higginbotham. No. 53 Moffatt Building, Detroit, Mich., from whom copies of plans may be had at small expense.

Elmira, N. Y.—The plans of architects Pierce & Bickford have been accepted for the new $25,000 school house to be built here.

Rochester, N. Y.—A new $35,000 school house is to be erected for school No. 17. Address Commissioner Decker.

New York, N. Y.—Catholic Summer School Building & Improvement Co. has been incorporated with $100,000 capital for the purpose of improving lands and erecting buildings at Plattsburg. Address J. D. Crimmins, New York.

Randolph, Mass —A parochial school will be built in connection with the Roman Catholic church at Randolph, Mass., from plans of W. H. & J. A McGinty of Boston, Mass.

Newark, N. J.—The school house committee of board of education have selected the plans of architects Henry J. King and Gustave Staehlin for the proposed seventh and eighth ward schools. The new schools will be heated by steam.

McKeesport, Pa.—$65,000 worth of bonds will be issued for erecting a new school house in the seventh ward.

West Newton, Mass.—The school board has petitioned authorities to erect a 12-room school to replace the Pierce school. Chairman Hollis of school board will give details.

Orange, Mass —Plans of Geo. P. B. Aldeman of Holyoke, Mass., have been accepted for proposed new $30,000 school

Milford, Mass.—The special committee, through chairman E. L. Wires, has reported in favor of a $40,000 high school.

Bedford, Va.—A public high school is to be built in Bedford this fall. Superintendent N. D. Hawkins will give details.

Wilkesbarre, Pa.—Bids are invited for a system of ventilating, heating and dry closets for the proposed modification of the Moyallen street school building, as per plans at office of Thos. Podmore, architect. Wm. T. Smith, chairman of property committee.

Marlboro, Mass.—The Marlboro school board is now considering plans for a $30,000 high school.

Falmouth, Mass.—Trustees have decided to build a $20,000 school on the Lucy Swift lot.

Swampscott, Mass.—E. E. Strout of Lynn, Mass., was lowest bidder at $41,400 for the proposed new Phillipps school for Swampscott, contract not yet awarded.

Braddock, Pa.—The school board has decided to build a 16-room school, to cost $30,000, to replace that burned at North Braddock last fall.

New Paltz, N. Y.—A bill has been introduced at Albany by Assemblyman Lounsberry, appropriating $75,000 for the erection of an addition to New Paltz normal school to contain study hall, gymnasium, laboratory, and offices.

Manchester, N. H.—The joint standing committee on lands and buildings has been authorized to receive proposals and award contract for building the McGregorville school.

Worcester, Mass.—The committee on education reports that there is imperative need of new schools, one in Grafton street district, one in Upsala street district, one in Ledge-Lamartine street district, one in Chandler-Winslow street district. The committee also reports need of improved heating and ventilating for Thomas street, Winslow street, Chandler street, Gage street, and Lee street schools and in Woodland street schools. They have asked for $27,000 for sites, $118,000 for buildings. $15,000 for improved heating and ventilating.

Plainfield, N. J.—Messrs. Lovell, Finch, and Lounsberry have been appointed to secure plans for new high school building to be erected at Central avenue and west Sixth street.

Jermyn, Pa.—Work will soon be commenced on the new school house to be erected here to accommodate 250 pupils. J. P. McLaughlin of Scranton, architect.

Briston, Pa.—A new school house is to be erected at a cost of $50,000.

Washington, D. C.—Address Jesse H. Wilson in the matter of the proposed new $100,000 high school in West Washington.

New York, N. Y.—A new school is to be built at Henry and Oliver streets, for details of which address C. J. B. Snyder of the board of education, architect.

Evanston, Ill.—D. H. Burnham of 1142 Rookery, has made plans for a $30,000 school for Evanston.

Hotels and Theatres.

Quincy, Mass.—A stock company is being formed to build an opera house in Quincy, to cost $50,000. Senator John F. Merrill, A. G. Durgin, and John R. Graham are interested. It is to be located on Granite street.

Philadelphia, Pa.—John C. Bullitt, of Philadelpia.is at the head of a syndicate which proposes to erect a large hotel on the crest of the mountain, east of the Schuylkill river, near Pottsville, Pa. The Schuylkill Electric Railway is said to be interested.

New York, N. Y.—John Jacob Astor will erect a $100,000 addition to the St. Cloud Hotel.

Pittsfield, Me.—The Lancey House is to be enlarged and a modern system of steam heating will be introduced.

Olean, N Y.—The Olean House will be torn down and a new $50,000 hotel built, and the Old Moose House will be remodelled at a cost of $10,000.

Boston, Mass.—J. B. McElfatrick & Sons of 1193 Broadway, New York, are consulting with Abbey, Shoeffel & Grau in the matter of alternating Mechanics Hall into an opera house.

Scranton, Pa.—The Forest House is to be torn down and replaced by a nine-story hotel.

Lancaster, Pa.—Peter Ammon, owner of the Keystone House, proposes to tear down the Franklin House and erect a handsome new building.

Business Notes.

The Howard Furnace Co. of Syracuse, N. Y., are extending their trade in Michigan, and their furnaces are now handled in many cities there.

The Windsor Heater Co. of Galena, Ill., are equipping the residence of E. J. Andrews of Rockford, Ill., with the Windsor hot water boiler and radiation. The company are having a great many inquiries, and anticipate a good season's business.

Those of our readers who are interested in electrical machinery should visit the factory of the Eddy Electric Co., at Windsor, Conn., before it is too late, and see the new 200-kilowatt generator which is shortly to be shipped to the Cleveland Water Power Co., Cleveland, Ohio.

Chas. Erith & Co., heating and ventilating and drying engineers, 13 Little Trinity Lane, London, E. C., report that they are finding a very extensive market for the heating, ventilating, and drying apparatus manufactured by the Huyett & Smith Mfg. Co. of Detroit, Mich.

A well known company dealing with steam, plumbers, and gas fitters has received over four hundred letters from New England regarding the outlook for building this year. Two-thirds of the answers agree that it will exceed and the rest that it will equal the business of '92 or '93.

The last postal traveler sent out by the United States Heater Co. of Detroit, Mich., shows a cut of Mt. Hecla, after which their new steam heater is named. The descriptive matter is very attractive and suggestive, and these "travelers" must make friends for the heater wherever they are sent.

The Cowles Couch Co., 116 State street, Hartford, Conn., are the successors to the L. W. Cowles Co., formerly of 40 State street, Hartford, Conn., and 59 Church street, New Britain, Conn., and Geo. M. Couch & Co., who have been located at the first mentioned address. The new company report the outlook good, having about 24 houses on hand to plumb and heat.

On the 7th and 9th of March the representatives of the several branchas of the Howard Furnace Co. met at the home office in Syracuse for their second annual convention with the officers of the company. New York, Boston, and Grand Rapids were represented, and the reports for the past year and the indications for the coming year were very encouraging. The company entertained the employees at dinner at the Yates house, and the affair, all in all, was a most pleasant one, tending to solidify both employer and employee.

Olds & Whipple of Hartford, Conn., have just remodelled their store on Main street with the intention of carrying the largest variety of steam and hot water boilers of any concern in New England, and to that end are now getting in a full line of the H. B. Smith & Co.'s goods, including radiators. They have also arranged to use a portion of one end of their store for a stock of high grade Sanitas goods. Both of these departments will be in charge of Mr. L. R. Libby, formerly of the American Boiler Co., and an engineer of the highest class. The company have several contracts, and are figuring on many new ones.

The Howard Thermostat Co. of Syracuse, with a New York office at 210 Water street, has lately brought out an improvement on their thermostat radiator, by which the check of the fire in the furnace is accomplished through the ash pit, thereby avoiding any possibility of gas escaping, and affording a very quick and efficient check to the fire, without admiting cold air into the smoke pipe. They also have in process of manufacture a larger cylinder designed to furnish sufficient check for the largest size furnace and heating apparatus constructed. This method of automatically regulating hot air, hot water, or steam apparatus by the temperature of the room, is becoming very popular.

The Howard Furnace Co., 210 Water street, New York, have lately completed a contract for heating the Fourth avenue M. E. church, corner of Fourth avenue and 47th street, Brooklyn, using two of their largest size combination furnaces, with hot water radiators in each of the class rooms of the Sabbath school building, as also in the church audience room, together with the lecture room, ladies' parlor, and pastor's study. They have also placed a number of their combination heaters in private dwellings, and have just completed a dwelling for a prominent architect in Philadelphia, obtained through his advertising in HEATING AND VENTILATION. They have also under contract a school house on Long Island, and they have received very flattering commendations on the combination which they placed in Kings hotel at Amityville, L. I., in the early part of the winter.

Mitchell & Co., who handle Backus fans and water motors, have moved from 8 Oliver street to 154 Congrees street, Boston.

James Croke, the well-known expert decorator in bronze, has opened a Boston office at the corner of Federal and Franklin streets.

John A. Fish, the general manager of the Gurney Hot Water Heater Co., left Boston on the Cephalonia on March 24th for a six-weeks' business trip abroad.

A. C. Tuft, 41 E. Main street, Webster, Mass., writes us that he has lately taken the agency of the Furman steam and hot water boilers made by the Herendeen Mfg. Co. of Geneva, N. Y., and that the outlook for heating seems very good. He expects to put in several of the boilers soon.

The Armstrong Mfg. Co., of Bridgeport, Conn., who were the defendants in a suit brought against James P. Allen, one of their clerks, for an infringement of the Saunders' patent, No. 10,031, on a pipe cutter, have won their suit. This is the second decision in favor of the defendants.

The Smith & Anthony Co. of Boston have a large contract in Ohio, where they are placing a hot blast apparatus in a paper mill for drying purposes, using the Huyett & Smith apparatus. They have heretofore installed several of these same plants in New England, which led to their getting an order for this apparatus in Ohio.

The Dangler Stove & Mfg. Co., of Cleveland, O., have been assigned a patent for a heat radiator which was recently granted to Charles I. Dangler and Henry Ruppel. The invention relates to radiators in which gas is used for heating, and is a modification of the radiator an application for a patent on which was filed on April 6th of last year.

The Boston Blower Co., with its well-known push and energy, have secured the services of L. K. Barnes, formerly with the Sturtevant Co., and who is most favorably known to the trade in New York. Mr. Barnes will have his office in the Havemeyer Building, room 215. It is understood that he has already secured several good orders for his company.

Our readers should not forget that the annual convention of the National Association of Master Steam Fitters will be held at the Broadway Central hotel, New York, on June 19th, 20th, and 21st. There will be plenty of room for showing new appliances, and space can be secured at once by applying to the national secretary, Geo. H. Reynolds, whose headquarters are now at the hotel.

The table for calculating radiator surface which is shown in this number was prepared by Mr. J. L. Bixby, who is the heating engineer for Smith & Anthony of Boston. Mr. Bixby, who has installed many of their "Hub" heaters, found a table of this sort was a necessity, and has prepared it after much labor. It will be sent prepaid on receipt of fifty cents. Address the H. & V. Publishing Co., 145–146 World Building, N. Y.

The Boston Blower Co. have received an additional order from the United States Navy for fans for the Cincinnati, Raleigh, Neenah, and Bancroft. This order comes after a most severe trial, and is a most satisfactory recognition of the merit of their goods, which are used for draft and ventilation purposes. This company were also successful in securing the order for the fans in the 12th ward primary school in New York, and the Austin school, East Boston; also for a school in Brooklyn. Business has picked up with them so fast of late that they are working on almost regular time again.

Messrs. Curtis & Curtiss of Bridgeport, Conn., manufacturers of the Forbes patent die stocks and all kinds of pipe working tools and machinery, find their goods are coming into such general use abroad that they have decided to send one of their firm to consult with their foreign agents, who are scattered throughout Europe, and to look after their interests generally. Mr. Lewis B. Curtis expects to sail on May 16, and will be absent about three months. They inform us that they are running their works with a full force, and are very busy with both foreign and domestic orders.

It is perhaps not generally known that at the present time the American Radiator Co. have a warehouse located on Farnsworth street, S. Boston, which until the building of the new storehouse at Harrison, N. J., will be the largest of its kind in use for such a purpose. The Boston building is 200 feet long and 100 feet wide, and has facilities for assembling and repairing. Besides the first floor, there is a second story with 10,000 feet of surface. The company have a spur track of their own to the N. Y. & N. E. R. R., 700 feet long, besides the public side track, which gives them at least 300 running feet of unloading facilities.

We have received a copy of the Watertown (Dak.) *Hampeskian*, in which appears a long article upon the heating apparatus in the new high school building. The contractors were Hess & Bradley, and the plant has proved satisfactory beyond expectations. The paper goes on to say that Watertown now has the most elaborate if not the only mechanical heating and ventilating plant in the state, and the principal of the school figures that he can get nearly a third more work out of the pupils. The plant consists of two 50 horse-power low pressure boilers, and one 12 horse-power high pressure boiler. A 10 horse-power engine moves the fans, which have a capacity of 30,000 cubic feet of air per minute.

The Peninsula Stove Co., of Detroit, send us a sample label, such as they now use on their line of French drop-oven-door stoves and ranges. The design is a very pretty one, with a stamp of their trade mark both on the right and on the left, with appropriate reading matter. A word about these goods might interest the trade. Instead of the usual swing door they are made with a double door, the lower part consisting of a drop door and the upper half a swing door. When the drop door is opened it forms a strong flush oven shelf, and when closed it is up and out of the way of dresses, etc. When the oven door is opened to inspect the contents of the oven, the upper half or swing door remains closed and retains the larger part of the heat, which which would be otherwise lost. This avoids cooling off the oven and spoiling the baking every time the door is opened.

It is reported that the Ideal Boiler Co. has been incorporated in Chicago with a capital of $100,000.

The Quick Meal Stove Co. of St. Louis, Mo., are doing an excellent business with gasoline stoves.

F. W. Singer & Co. of Baltimore have taken the agency for Fuller & Warren Co. of Troy, in that vicinity.

Mr. C. M. Wooley, secretary of the American Radiator Co., is reported to have gone to Europe on a short business trip.

Over twenty carloads of Utter's gas and oil stoves were sent to agents throughout the country during the first two weeks of March.

Allen & Crain of Raleigh, N. C., recently received a carload of direct and semi-direct Fowler radiators for a large building in that city.

The Smith & Winchester Co. of Boston are to handle the new quick opening steam valve just being put on the market by the Detroit Lubricator Co.

The Barney Ventilating Fan Co. of Boston have temporarily moved to 54 Oliver street, that city, on account of a fire, during which the whole building they formerly occupied was water soaked.

Ralph C. Wright is now representing the Snow Steam Pump Co. of Buffalo as erecting engineer. Mr. Wright has had a varied experience, and is thoroughly posted in his line of work.

"Howard Heaters Heat Houses" is the title of a sample postal card which the Howard Furnace Co., of Syracuse, N. Y., are sending out. This company is a hustling one, and don't propose to get left when there is any business to be had.

L. J. Wing & Co., the well-known ventilating engineers, will remove about May 1st from 126 Liberty street, New York, to 109 Liberty, one block from Broadway, where they will have a large store and shop, giving them better facilities for their increasing business.

The new catalogue entitled, "Hot Water Heating," by Smith & Anthony of Boston, is out. It is neatly printed on heavy calendered paper, and describes the principle of hot water heating, having a cut showing a simple system of piping, and giving other valuable suggestions. The Hub hot water heater is fully illustrated, and a few of their best testimonials are published. Mention HEATING AND VENTILATION and get one.

A. T. Henderson, vice-president of the United States Heater Co., has just completed a business trip through the East. Mr. Henderson reports that his company is well satisfied with the outlook, and that they are making preparations to push their goods more extensively in the East.

We regret to announce the death, at Canton, Ohio, of J. H. McLain, president of the J. H. McLain Co., which occurred on March 9th. Mr. McLain was born in Massillon, O., Nov. 16, 1841, and his career has been one by which the town of Canton has received much benefit. His funeral, which was held Sunday, March 11, was attended by many noted personages, among whom was Governor McKinley.

Barber & Ross of 11th and "G" streets N. W., Washington, D. C., have added a heating department to their already extensive business. This department will be under the management of W. H. Pennell, who has had twenty-five years' experience, during which time he has installed some very fine plants both in direct and indirect work. He will be assisted by an able corps of workmen. The company will handle the "Novelty Circulator" for hot water work.

The Boynton Furnace Co. are never at a loss for good testimonials, as the work they do is a constant testimonial of the best in the heating line. The Rockwell House at Glen Falls, which is a very large building and about which were doubts before installation as to the heating, which was by hot water, and in which the Boynton apparatus was installed by G. E. Adams & Co., is an instance of first-class work, praised by owners and competitors. This is only one of hundreds. Special apparatus has been designed by them for soft and hard coal and gas. This company has no connection with any other firm using the name "Boynton."

Sanitas Plumbing Appliances is the title of the new catalogue lately published by Smith & Anthony regarding their improved line of patented closets, lavatories, traps, bath tubs, sinks, and other plumbing requisites, which are constructed on scientific principles, at the same time having the equally important feature of simplicity. The most important desideratum in any plumbing system is the rapid and thorough removal of household wastes, while an equal necessity is the use of fixtures which will interpose a complete barrier to the escape of noxious odors or gases into the house. By the use of the Sanitas system of plumbing the pipes are filled full bore and effectually scoured at each discharge. Protection is further guaranteed by the use of the Sanitas trap, which retains its seat against siphonage, cock pressure, evaporation, etc. Attractiveness of design and low cost are two other special features of this line. This catalogue, which is profusely illustrated and handsome in every way, will be sent free to all reliable plumbers.

"The Art of Coppersmithing" is the title of a practical treatise on working sheet copper into all forms, by John Fuller, Sr. It is a book of 327 pages, 10 by 6½ inches, and is published by David Williams, 96–102 Reade street, New York, at $3 per copy. This book, which as a serial appeared in *The Metal Worker*, is brought out to meet the needs of a body of sheet metal workers whose trade has never before been thoroughly described. The author, as he states in his preface, acquired proficiency in copper working through a long apprenticeship and many years of actual labor at the bench. The instruction he gives is, therefore, entirely practical and will be correspondingly valued by those who are in any way interested in coppersmithing. A special feature of the work before us is the illustrations, of which there are nearly 500, and which add much not only to the interest, but to the value of the text, as they show the work in all stages of progress and illustrate all the appliances, patterns and tools. The work is divided into sections, each treating a separate topic, and is thoroughly indexed. The style of the writing is exceedingly simple and the descriptions of work go into the smallest details, a fact that will be especially appreciated by those who read the book for instruction in this handicraft.

Rathbone, Sard & Co., of Albany, N. Y., are now running on full time.

Bussy, McLeod & Co., Troy, N. Y., are now running again with full force.

The Glazier Oil Stove Co., Chelsea, Mich., are erecting a brick addition to their power house.

C. S. Groves, formerly with the Model Heating Co. in their New York office, is now connected with the American Boiler Co., 94 Centre street, New York.

Send for the new catalogue just issued by A. Weiskettle of Baltimore, Md., if you are interested in gas stoves and ranges. They manufacture all kinds.

The Marcy Stove Repair Co., of Beekman street, New York city, have purchased five acres of land at Perth Amboy, N. J., and are to erect new buildings.

Eaton, Cole & Burnham Co., now at 82–84 Fulton street, New York, will remove to the new building on the corner of Beekman and Gold streets, on or about May 1st.

The Standard Lighting Co., of Cleveland, O., have much improved their New Process vapor stove for 1894, and report their sales as being 50 per cent greater than last year.

One of the New York city corporations is the Bramhall Deane Co., organized for the purpose of manufacturing heating, ventilation, and cooking apparatus. Capital $300,000.

The Harell Steam Heating Co. of Dunkirk, N. Y., have opened a branch office for the sale of their Splendid radiators at 217 Lake street, Chicago, with J. A. Cunningham, Jr., in charge.

W. R. Park & Son, Taunton, Mass., after describing direct and indirect radiators and where most generally used, incidentally call attention to the line of "Richmond" goods handled by them.

Higgins & Co., 379 Lexington avenue, N. Y., issue two books on Richmond heaters. This company have recently opened a branch at Mt. Vernon, to accommodate their rapidly growing country trade.

The Fowler Radiator Co., of Philadelphia, Pa., has received the order for the radiators for the North Carolina School for the Deaf and Dumb. The order calls for about 10,000 square feet of Fowler semi-direct radiators. The Brewster Hardware Co. of Raleigh, N. C., are the contractors.

The Mt. Penn Stove Works of Reading, Pa., have opened a Philadelphia office under their own auspices at 111–113 Second street. They propose to keep in stock a line of oil, gas, and gasoline stoves, in fact, a full line necessary to a stove dealer's business. George Uniacke will be the local manager.

We have just received from Albert A. Cryer Co., engineers and contractors, 85 Centre street, New York, a new catalogue of the Richmond line of steam and hot water specialties, for which they are agents. As Cryer & Co. are doing some of the best work now being done in New York city, it is unnecessary for us to enter into a further description.

W. H. Switzer, the general manager of the Superior Furnace Co., of Little Falls, N. Y., is now calling upon the many customers of this popular line of heaters throughout the Western states. The prospects bid fair for a large increase in sales for 1894, judging from the many new agencies now being established and the placing of some large orders for early delivery.

The Herendeen Mfg. Co., of Geneva, N. Y., are now making patterns for a twelve, fourteen, and sixteen inch grate to go with a line of small boilers they are about to bring out. These boilers will be built both with and without pockets, and in their construction differ entirely from anything heretofore placed on the market. They have a great amount of direct and intense heating surface and will be very economical in the consumption of fuel. They are built both for steam and hot water. The name will be "The Furman, Jr."

The new catalogue of the Backus Water Motor Co., who have lately removed to their new factory, 182 Pennsylvania avenue, Newark, N. J., describing the Backus patented rotating and exhaust ventilating fans, of which they manufacture a full line, has been received. They are also manufacturing a line of gas engines for driving fans and other work, such as cutting pipe, etc. Steam fitters and plumbers who only use power a part of the time should send for a circular of their gas engines, which would be an economical power for almost any shop.

The Armstrong Mfg. Co. of Bridgeport, Conn., have long occupied an enviable position among manufacturers of water, gas, and steam fitter's tools as one of the most prominent and successful in the trade. The factory at Bridgeport, which is an extensive establishment, is equipped with the latest and most improved machinery and mechanical appliances obtainable, for the manufacture of the high grade tools turned out, and only skilled workmen are employed in all of the various departments. The adjustable stocks and dies, improved pipe cutting and threading machines, vises, cutters, wrenches, etc., made by the Armstrong Mfg. Co., have attained an international popularity and are standard goods. A noticeable feature of all products of this concern is the manner in which they are constructed with view of saving time and labor in their use. This is a marked characteristic of their new pipe threading and cutting-off machines, which it may be remarked show the result of much experimenting and long study with the end in view of turning out a line of machines of this class that could be thoroughly recommended and of superior merit. They are presented in several sizes and patterns, adapted for either hand or power, and adjustable to variations in fittings. They will cut off and thread pipe from one to six inches inclusive in from two and a half to four minutes, according to size. When run by hand the time consumed by threading depends necessarily upon the activity of the operator turning the crank. The saving in time and labor otherwise necessary on the part of the attendant is considerable, and is a point worthy of consideration in favor of these machines. In a recent catalogue the company show their full line of these machines and a number of other tools of improved design, with price-list of same. It may be obtained direct from the Bridgeport headquarters, or will be furnished upon application at the New York office of the company, which is located in the Cornell building at 139 Center street, that city.

Architects and building contractors or others interested can obtain free the National Electric Light Association's standard rules for electrical construction and operation by applying to Geo. F. Porter, secretary, 136 Liberty street, New York.

W. H. Oakes, formerly New England manager of the American Boiler Co., and one of our best posted engineers on heating, has purchased an interest in the firm of Buerkel & Co. of 28 Union Park street, Boston, and will hustle for business in that territory, and we predict he will get it too.

"What Are We Here For?" is the title of a little book just issued by the United States Heater Co. of Detroit, which contains a report of Leceister Allen on the efficiency of their heater, and a fine array of testimonials as to their satisfaction in use.

The Garden City Fan Co., Chicago, Ill., have just completed an outfit for heating and ventilating the large new chemical works of W. S. Merrell Chemical Co., Cincinnati, O. This is one of the largest concerns of the kind in the country, their new factory being one of the most modern, as well as the best equipped in the world. The factory and magnificent offices are heated and ventilated throughout by the hot blast system, using the Garden City duplex or double fan and sectional heater. The results obtained are highly creditable to the manufacturers, and the outfit is without question one of the most complete and perfect hot blast outfits ever installed. The company also report other contracts on hand, and are at present hard at work on a large contract for St. Louis parties. They predict for their duplex fan and heater a "front seat."

Maj. A. G. King, manager of the Chicago office of the Herendeen Mfg. Co., writes that he is now nicely settled in his new office at 131 Lake street, and every day demonstrates the wisdom of the change. He has received many calls from steam fitters that he would never have received at his old office in the Unity building. He reports several fine contracts, and thinks business will be good in Chicago this year. Mr A. E. Soroge of the Milwaukee office also writes that he is figuring on a great many contracts and the prospect for good business in Milwaukee this summer looks bright.

The Dudley Bros., who represent the Furman in New York are never behind hand, allowing no grass to grow under their feet. They are making these goods known better than ever in the metropolis and vicinity.

Ask us Questions about Designing, Engraving, Electrotyping, Embossing, etc., is the title of specimen book "F" which we have received from A. Mugford of Hartford, Conn., who is doing much of the work for the manufacturers of the boilers, radiators, and steam specialties. Beautiful wood cuts of the Buffalo Forge Co., Raymond & Campbell, Middletown, Pa., the Jarecki Mfg. Co. of Erie, Pa., Curtis & Curtis, H. B. Smith Co., Westfield, and other, are shown. Each detail in Mr. Mugford's business is in the hands of an expert, and the best talent that experience can select, or money engage, is employed. Everything is under one roof and one management, and we would advise our readers to correspond with this house when in need of work of this kind.

The Milwaukee Gas Stove Co. will open a New York office at 7 West 14th street on May 1st. E. O. and W. K. Stafford will be the managers.

Manufacturers of heating and ventilating apparatus are requested to send catalogues to J. Fairley Wieland, architect, Room 1, Porter Building, San Jose, California.

D. W. Mullen, formerly of Lowell, Mass., has opened a store in Newtonville, Mass., under the name of the Newtonville Heating and Plumbing Co., and will do all kinds of heating and plumbing work.

A very neat monthly calendar is to be printed and circulated by M. Mahony of Troy, N. Y., which besides being artistic otherwise is embellished by the well-known trade mark of the manufacturer.

The New York office of Huyett & Smith of Detroit has been removed from 107 Liberty street to the New Havemeyer building, 26 Cortlandt street, where C. E. Wendover will be glad to see all his old friends.

Albert A. Cryer & Co. have closed a contract to heat two parochial schools on 79th street, New York, using Richmond sectional heaters. Also Becker's Hotel, White Plains, using Richmond hot water heaters.

We have just received from H. Sandmeyer & Co., 215 S. Adams street, Peoria, Ill., the new catalogue of Dickson dry and ventilated flash closets and system of heating and ventilation, which is fully illustrated and can be obtained upon application.

The Mason Regulator Co. of Boston send us a box of dominoes as their latest advertising novelty. We are too busy to use ours, but they say they will send them to anyone for twelve cents, so if time hangs heavily on your hands get a box and play.

The Exeter Machine Works, of Boston, have made arrangements with the John Simmons Co., of 106–110 Centre street, New York, to handle the Exeter radiators in New York state and in New Jersey. They are sole agents for that territory, and are prepared to fill all orders promptly. Write for circulars and prices.

The Griffith Heating and Plumbing Co., of Spokane, Washington, announce under date of March 1st, that the Griffith Heating and Ventilating Co. and Wicks, Hughes & Griffith have consolidated and are now prepared to furnish estimates on public buildings and private dwellings for heating, ventilation, and sanitary plumbing. The members of the new firm are J. H. Griffith, Geo. H. Hughes, and Geo. E. Clark. All correspondence and communications will receive prompt attention.

All communications to the Master Steam and Hot Water Fitters' Association of the United States, should, until after the steam fitters' convention, be addressed to Geo. H. Reynolds, secretary, Broadway Central Hotel, New York City. The convention will be held at the above hotel, June 19th, 20th, and 21st and will without doubt be attended by the largest body of master steam fitters ever assembled at any convention in this country.

(*Continued on page 30.*)



The Sanitas Trap.

FOR THE BATH ROOM

there is nothing equal to

THE SANITAS PORCELAIN BATH.

It is the perfection of **Cleanliness** and **Purity,** and when used in connection with our other Bath Room specialties it gives a combination unrivaled for sanitary perfection.

THE SANITAS TRAP

is an ideal protection against **siphonage, back pressure** and **evaporation,** and is used in **Bath Tubs, Wash Basins, Sinks, etc.** The Sanitas Appliances are specified by the leading Architects of the country and are to be found in the best buildings. The co-operation of Plumbers everywhere is desired.

Send for special catalogue.

SANITAS MANUFACTURING CO.,
SMITH & ANTHONY CO., Proprietors,
Boston, Mass.
56 Beekman St., NEW YORK.
217 Lake St., CHICAGO.



The Sanitas Bath.

E. H. Doyle, for the past five years with the Richardson & Morgan Co., on Beekman street, New York, has accepted a position with the A. A. Griffing Iron Co., and will look after the "Bundy" interests locally in New Jersey.

The contract for the heating and ventilation of the new and old buildings and warden's residence for the Morristown Prison has been awarded to the Penn Engineering Co., 312 Cherry street, Philadelphia. The work was laid out by Mr. M. J. Hanna, engineer for the company, and is a decided victory for the Penn Engineering Co., they receiving a preference of nearly $1,000 on the work over other prominent engineers and bidders.

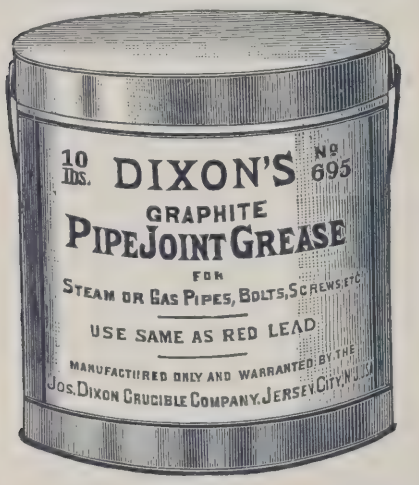
The A. A. Griffing Iron Co. of Jersey City, N. J., have opened a New England office at 177–179 Fort Hill Square, Boston, right in the heart of the heating trade. Mr. Charles A. Lathrop will be their manager. It is the intention of the company to make this a regular distributing point, and a full line of samples and large stock will be carried. They will also remove their Chicago store immediately to 34 Dearborn street, from 88 Lake street, where they had only part of a store. Their new quarters will give them ample room to show a full line, and they will still retain large store-rooms near the Union station, so as to be able to promptly fill orders.

Every steam fitter should have a copy of the 1894 catalogue of the Jarecki Mfg. Co. of Erie, Pa., as it describes by practical illustration almost everything in the way of malleable iron gas, water, and steam fittings, which are manufactured by them in their immense factories at Erie, Pa. One could hardly imagine the variety of pipe cutting machinery they manufacture until he had looked over 46 cuts, followed by a countless number of cuts of the dies and tools used with them. Radiators, artesian well machinery, valves of all kinds, besides other things too numerous to mention, are all to be found illustrated here. The company aim to make their prices the lowest for good material. Send for catalogue.

WANTED.

Announcements in this department will be inserted at the uniform rate of twenty-five cents per line. For five or more insertions of the same advertisement we make a discount of 10 per cent. Calculate on nine words to a line.

WANTED.—A man who is informed in the practice and theory of plumbing, heating and ventilation and who has sufficient literary ability to write for a trade journal. Address The Colliery Engineer Co., Scranton, Pa.



FAR BETTER AND CHEAPER THAN RED LEAD

Makes a tighter joint than red lead, that can be opened with perfect ease many years after.

Invaluable for all steam, gas and water piping, and equally useful for smearing gaskets on flange joints of meters, traps, and for bolts, screws, etc.

JOS. DIXON CRUCIBLE CO.,
JERSEY CITY, N. J.

FANS

HEATING AND VENTILATING ENGINEERS

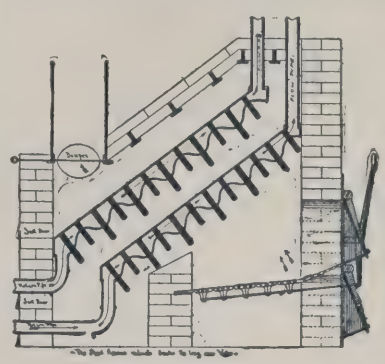
WE MAKE EVERYTHING IN THE FAN LINE.

BLOWERS

THE LARGEST MANUFACTURERS OF FANS AND BLOWERS IN THE WEST

HOT BLAST APPARATUS.

GARDEN CITY FAN CO.
Chicago, Ill.
Send for Catalogue. "H"

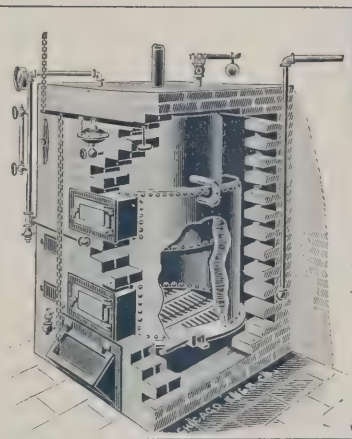


Stanton Heater.

The
STANTON
HOT WATER HEATER.

Rapid flow. Double heating surface. No packed joints. Only three screw joints exposed to fire. Connected at walls with malleable iron fittings. No soot to clean when bituminous coal is used. Send for circulars giving full description.

Henry Stanton,
Flushing, Ohio.



THE IMPROVED
HAXTUN BOILER
FOR STEAM AND HOT WATER HEATING.

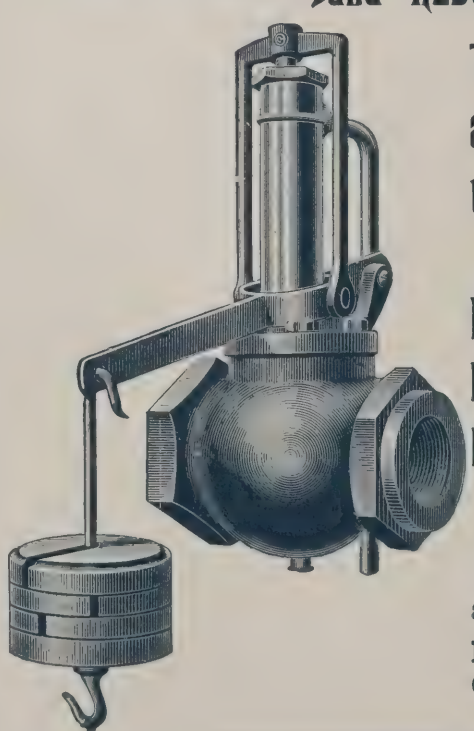
ECONOMICAL. *No Tubes to Clog Up.*

Magazine with Front Feed—can use HARD OR SOFT COAL.

BEEN IN SUCCESSFUL USE 18 YEARS.

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KEWANEE BOILER CO., KEWANEE, ILL.
Chicago Office, Cor. Dearborn and Lake Streets.
Send for "Haxtun" Catalogue No. 2.

The "DAVIS" PRESSURE REGULATOR and REDUCING VALVE.



The Simplest and consequently the Best.

No Springs, Diaphragms or Rubber.

Can be used for a greater variety of purposes than any other on the market.

MANUFACTURED BY

Eastern Office,
136 Liberty Street,
NEW YORK.

G. M. DAVIS & CO.,
90 N. Clinton St., CHICAGO.



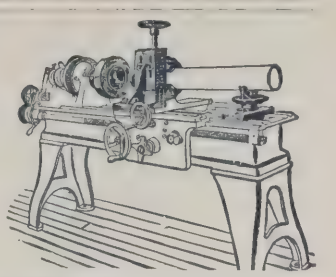
THE BOILER MANUFACTURERS

who have their boilers illustrated in this issue should all use our pipe cutting and threading machinery; if any of them don't they should investigate the merits of these machines and see how they can save time, money, labor and expense over the old fashioned way of cutting and threading pipe. Our machines are built of the very best materials and by experienced workmen, and are fully guaranteed. Correspondence solicited. We manufacture

Forbes' Patent Die Stock, Pipe Cutting and Threading Machine for Hand or Power. Also Pipe and Bolt Threading Lathe Attachment.

SEND FOR ILLUSTRATED CATALOGUE.

CURTIS & CURTIS, 46 Garden Street, Bridgeport, Conn.



Portable Hand Machines we make enable one man to cut and thread 8 inch pipe. The Curtis Pipe and Bolt Threading Attachment for Lathes.



View of Fan with Engine attached.

Manufacturers of

Exhaust, Ceiling, Column

and

Electric Fans.

Special Discount if you mention this paper.

Chicago Water Motor & Fan Co.,

99 to 101 Lake St., Chicago, Ill.

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Heating and Ventilation of Residences.

Illustrated with 18 plates showing methods of heating by

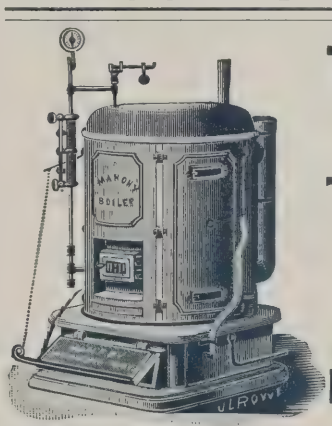
Steam, Hot Water and Hot Air.

Also contains tables on Temperatures, Radiation, Hot Air, Stacks, Registers, Etc.

A valuable work for fitters sent postpaid for half a dollar.

Address **The H. & V. Publishing Co.**

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THE MAHONY BOILERS.

For Steam or Hot Water.

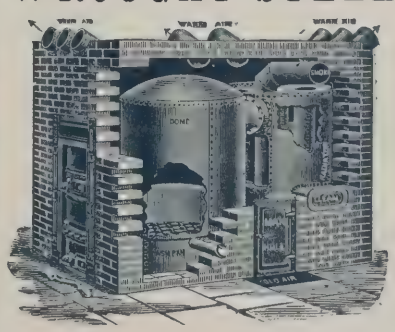
THOUSANDS IN USE,

And all Giving Satisfaction.

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WROUGHT STEEL WARM AIR FURNACES



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—FOR—

Public Buildings and Dwellings,

Warming and Ventilation of School Houses.

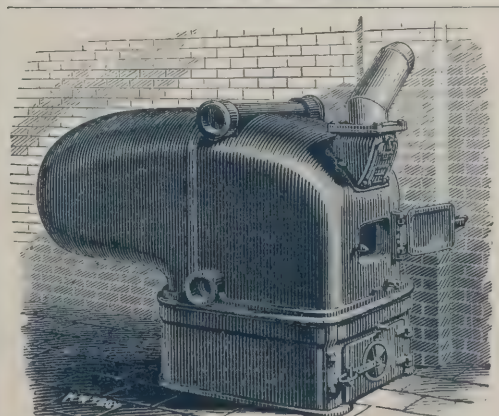
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HITCHINGS & CO.,

233 Mercer Street.

ESTABLISHED 1844.

Hot Water Heating Apparatus

for Greenhouses
Conservatories,
and Dwellings.

ALSO

WATER HEATERS FOR BATHS.

5 Styles of Boilers, 24 Sizes.

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1894 Bar-Lock does this.

Full details of its automatic movements mailed free.

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IN ARCHITECTURAL DRAWING,
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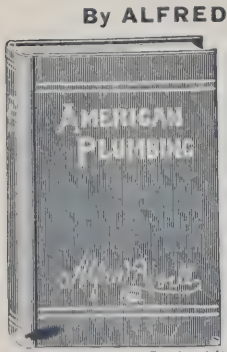
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4000 STUDENTS.

American Plumbing

By ALFRED REVILL.

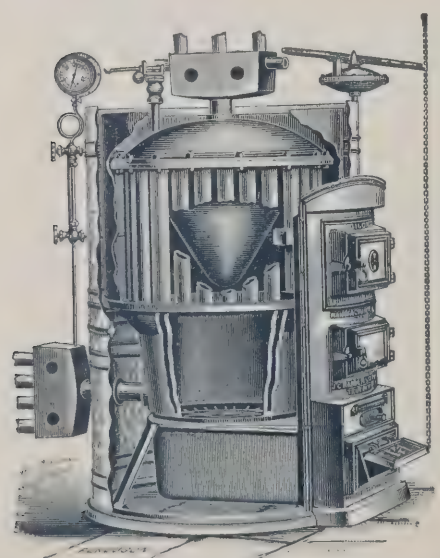


For Master Plumbers, Architects, Builders, Apprentices, Householders. A compendium of practical plumbing from soldermaking to high class open work. The only work on Plumbing containing a complete drainage system, elevation and plan, for use of architects and plumbers. This work tells How to make Joints of all kinds, How to make Traps, How to make Bends, How to set Fixtures, How to provide for Varying Head of Water, How to run Pipes, How to arrange Vents, How to find Defects, How to make Repairs, How to test Plumbing Work, Laws and Rules governing Plumbing, Form of Specifications. In short it gives in detail everything of importance great or small, in modern Plumbing. 225 pages devoted to the very latest improved sanitary methods and appliances used in plumbing. 225 pages, 138 Illustrations, large 12mo., Cloth. Illustrated.

Price, Postpaid, $2.00.

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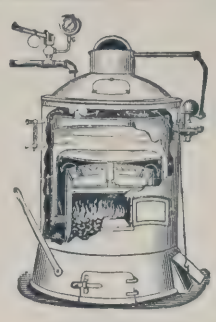


THE HENDERSON BOILERS

Give the
BEST SATISFACTION for Heating,
the MOST SURFACE
with the LEAST FUEL

They are Strong and Durable. They are easily managed and safe. Send for terms.

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TROY, N. Y.



THE NEW

"PEERLESS"

Steam and Hot Water Heater.

The Simplest Cheapest and Best.

A testimonial:

JOHN WANAMAKER, MECHANICAL DEPARTMENT,
PHILADELPHIA, PA.

DEAR SIR: In answer to yours in relation to the "Peerless" boiler in swimming pool at Chelton Hills would say the boiler has given us good satisfaction and heats the water well. As near as I can remember the pool is 14 feet wide, 58 feet long, 7 feet deep at one end and 4 feet at the other. We can raise the temperature of the water to 75 degrees in four hours. Yours truly, *JOHN WANAMAKER.*

For Catalogues, Testimonials, Terms, etc., address:

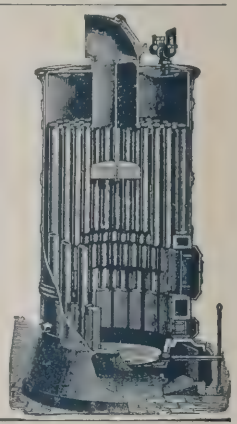
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114 & 116 Nassau Street, New York City, N. Y.

— Sole agents for the United States. —

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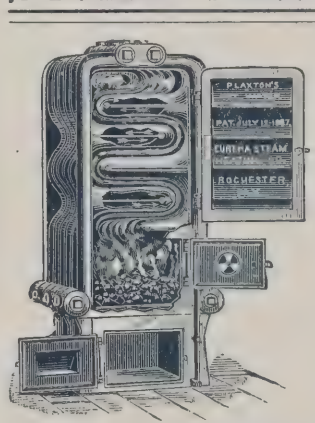


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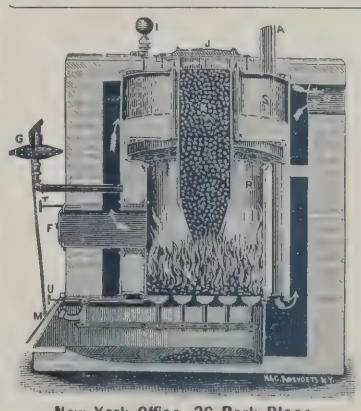
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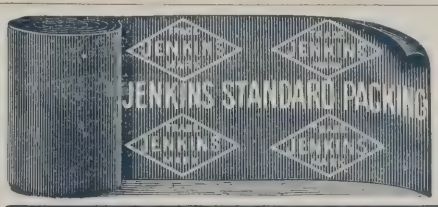
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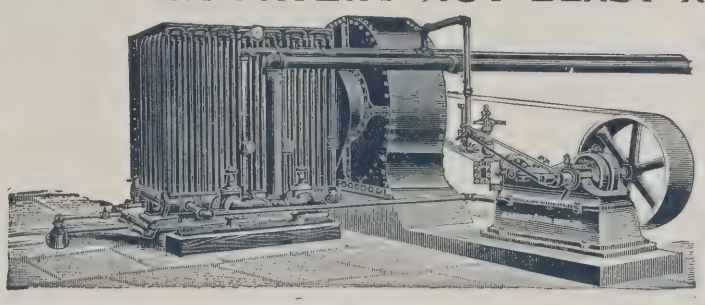
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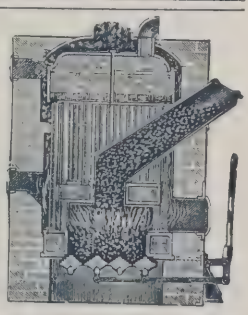
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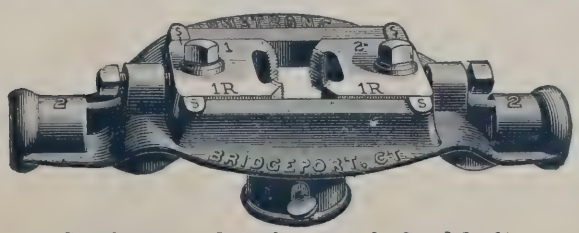
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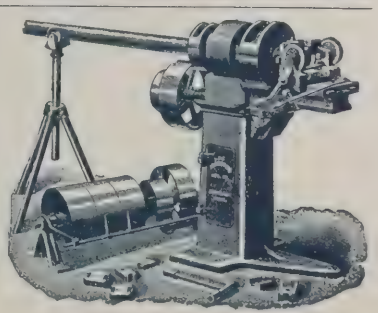
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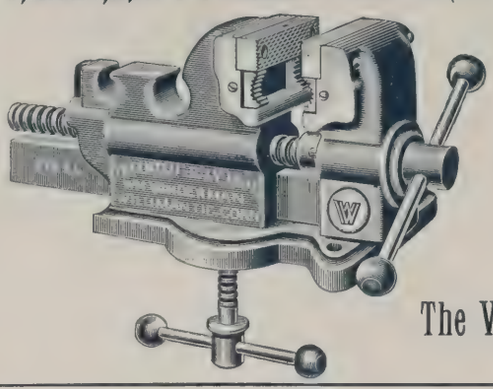
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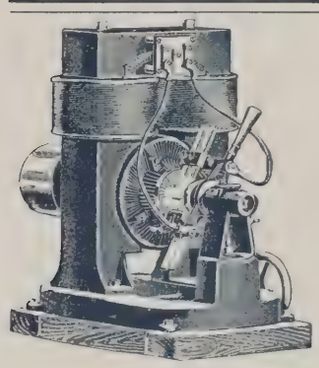
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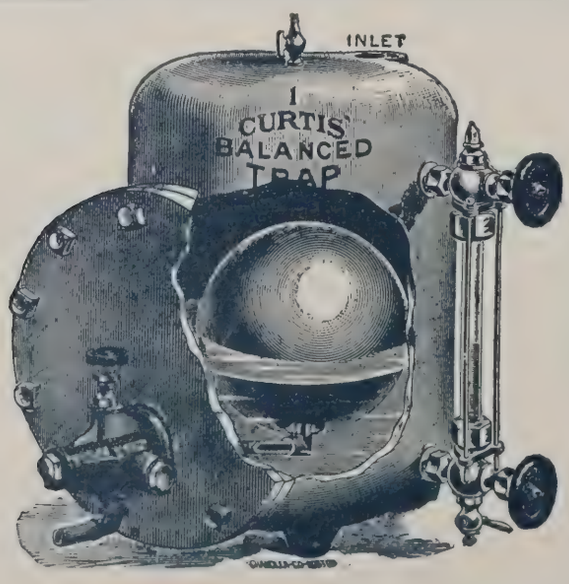
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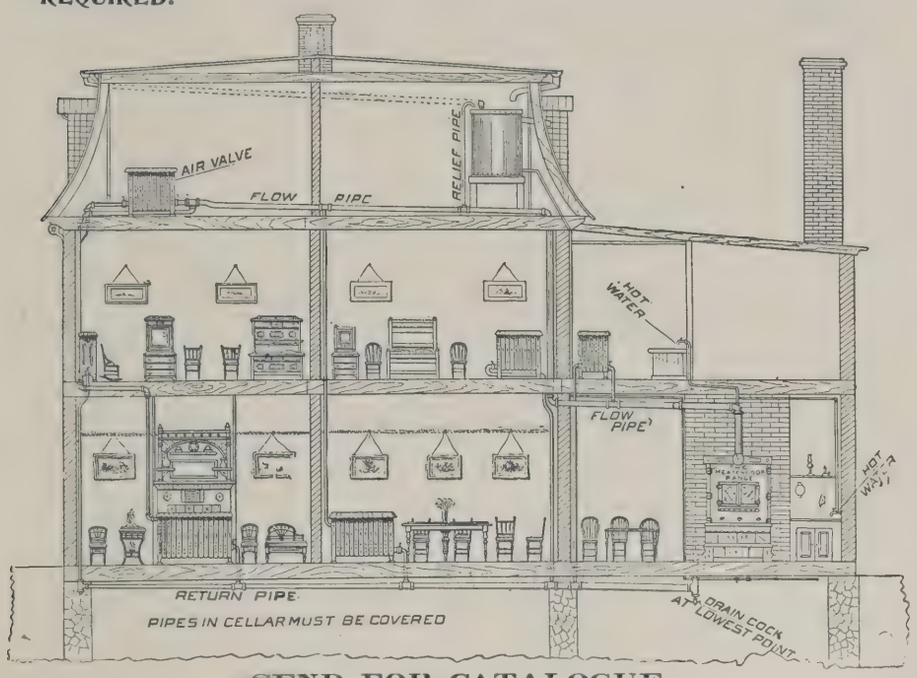
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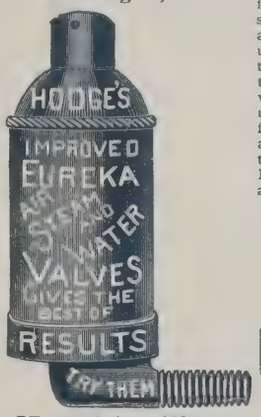
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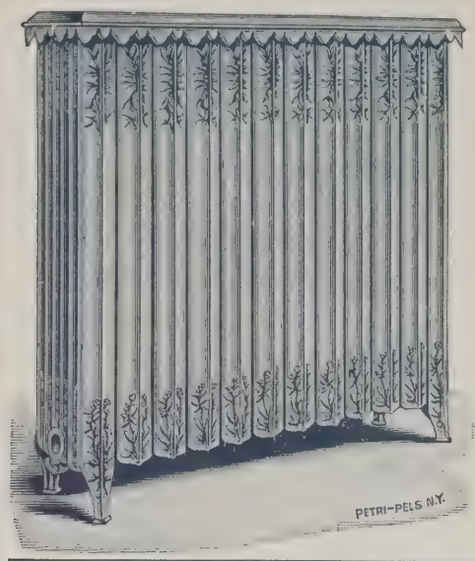
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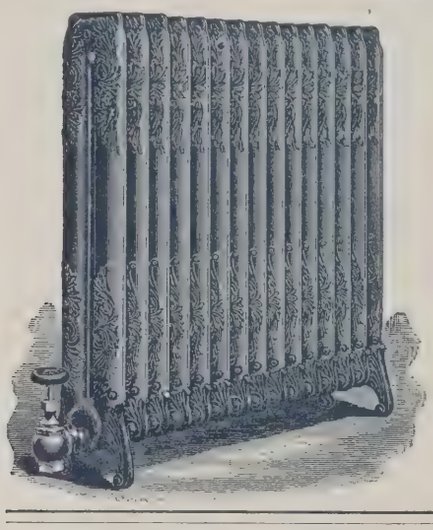
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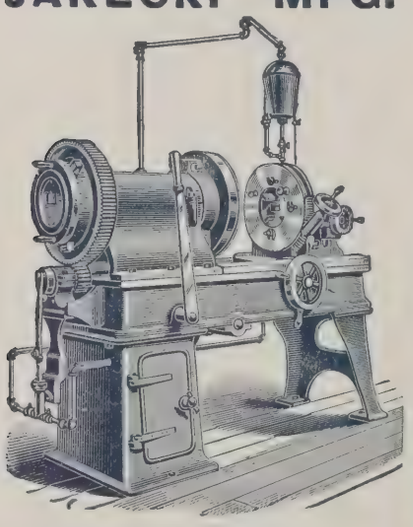
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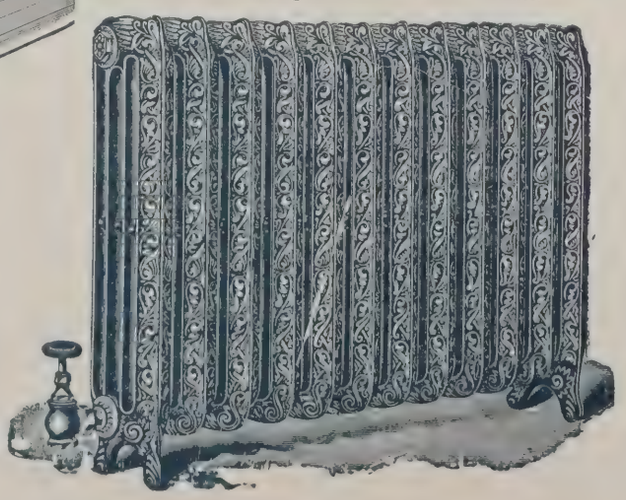
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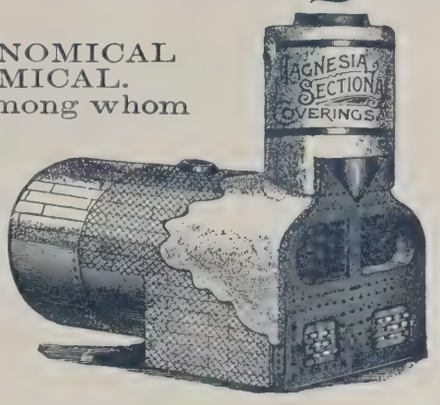
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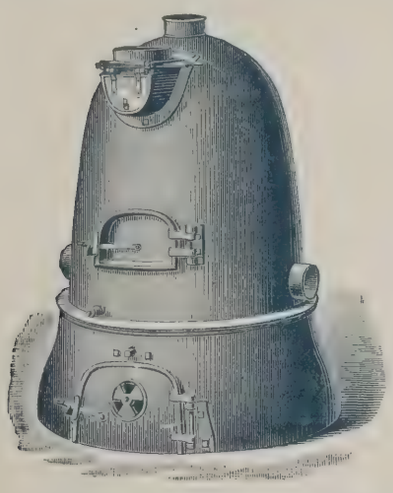
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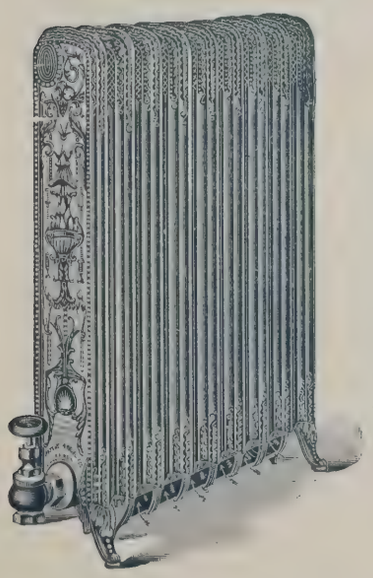
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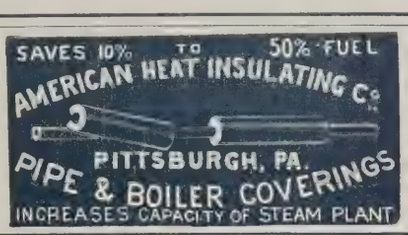
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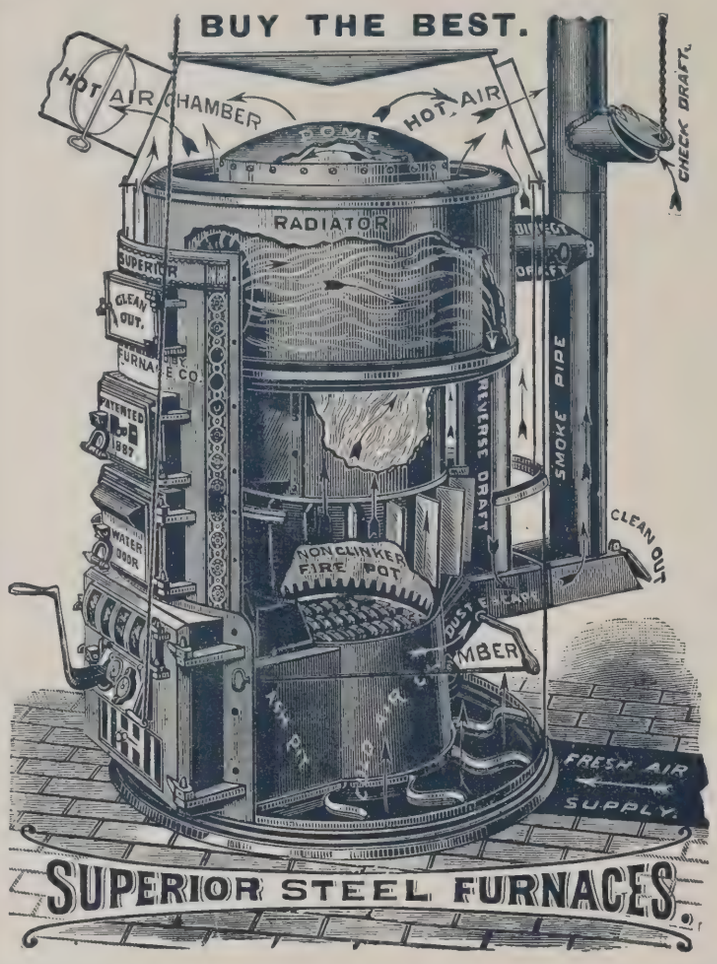
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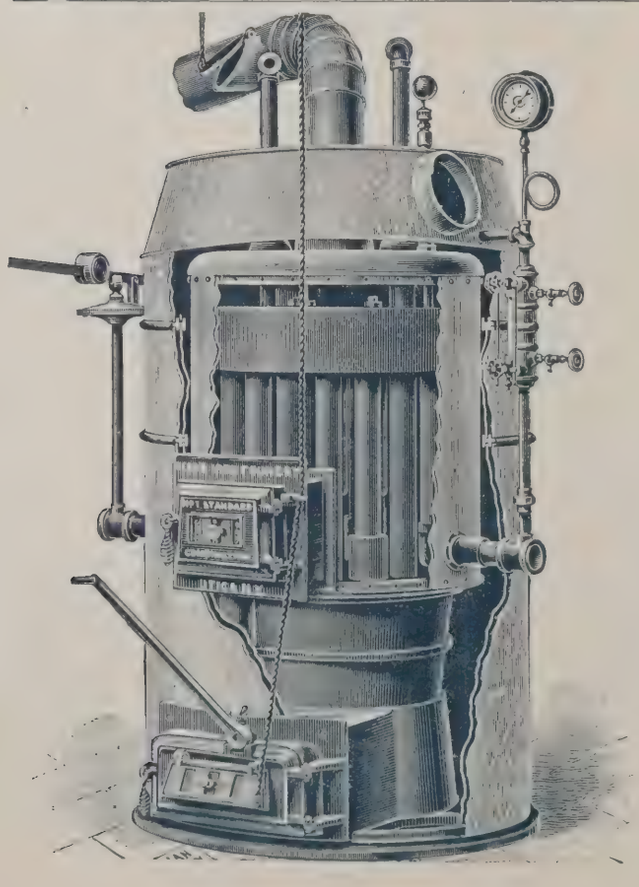
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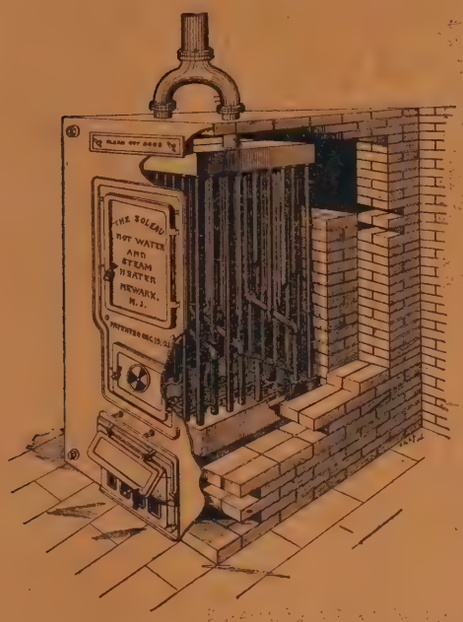
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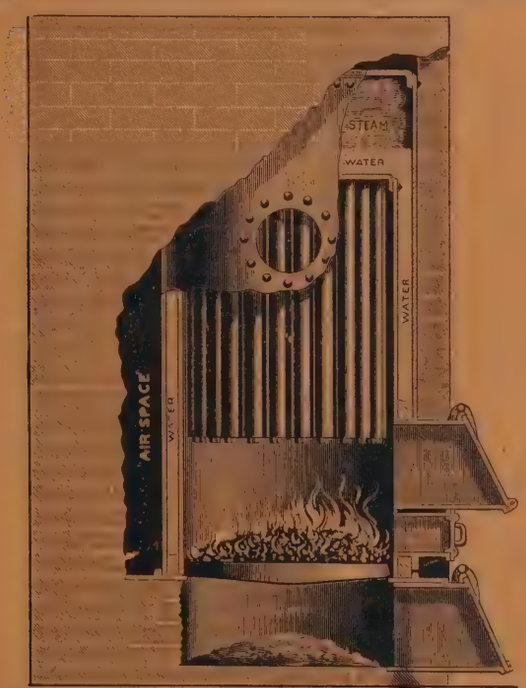
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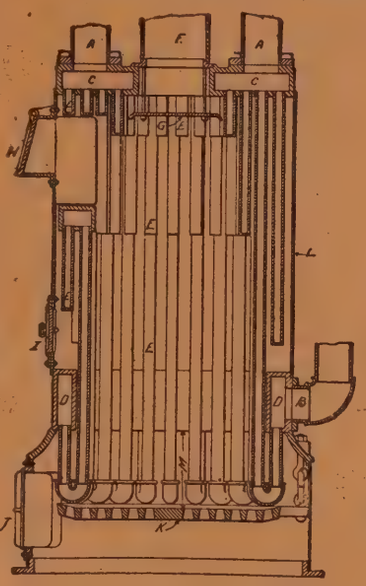
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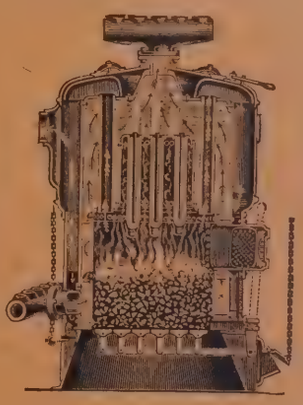
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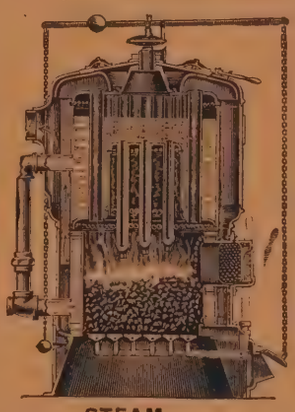


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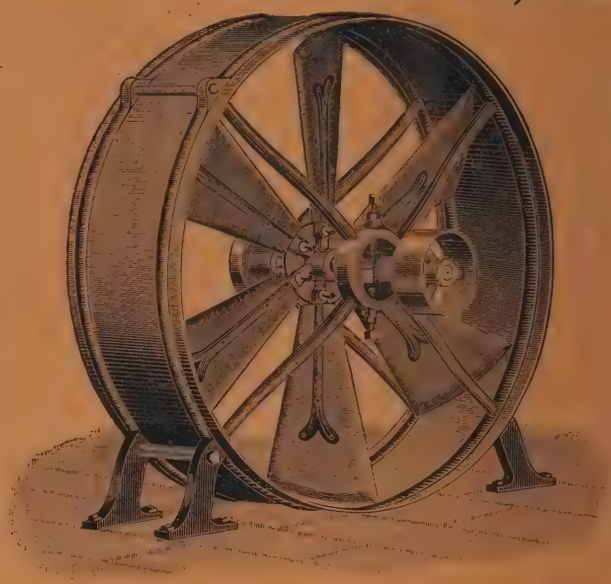
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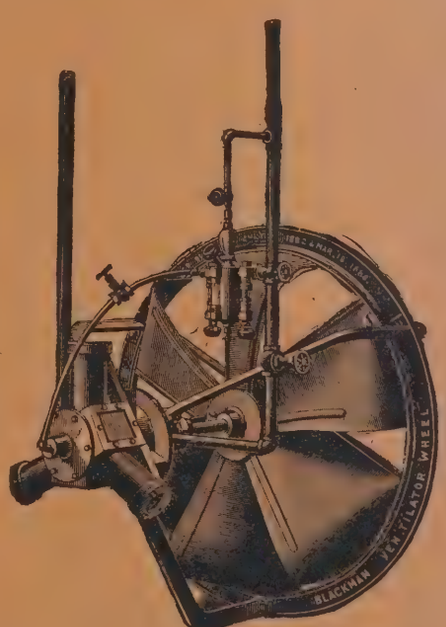
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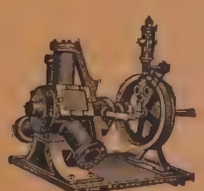
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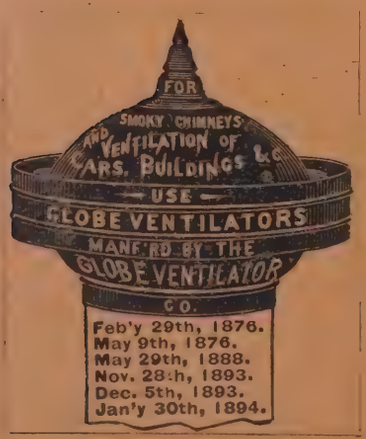
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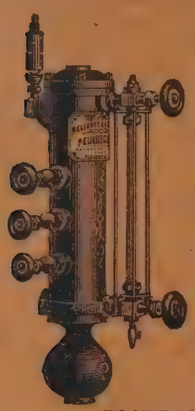
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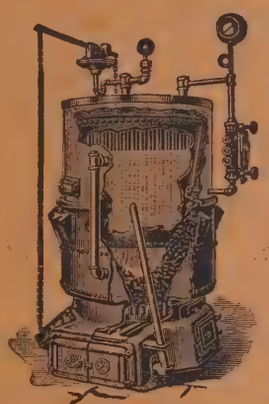
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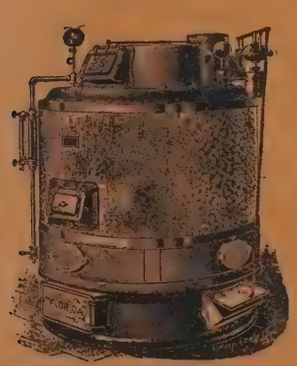


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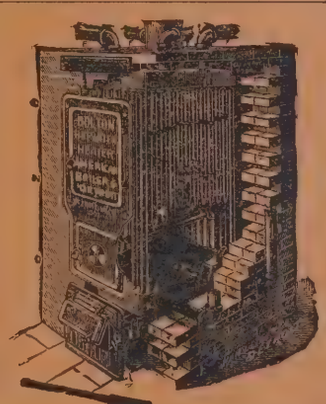
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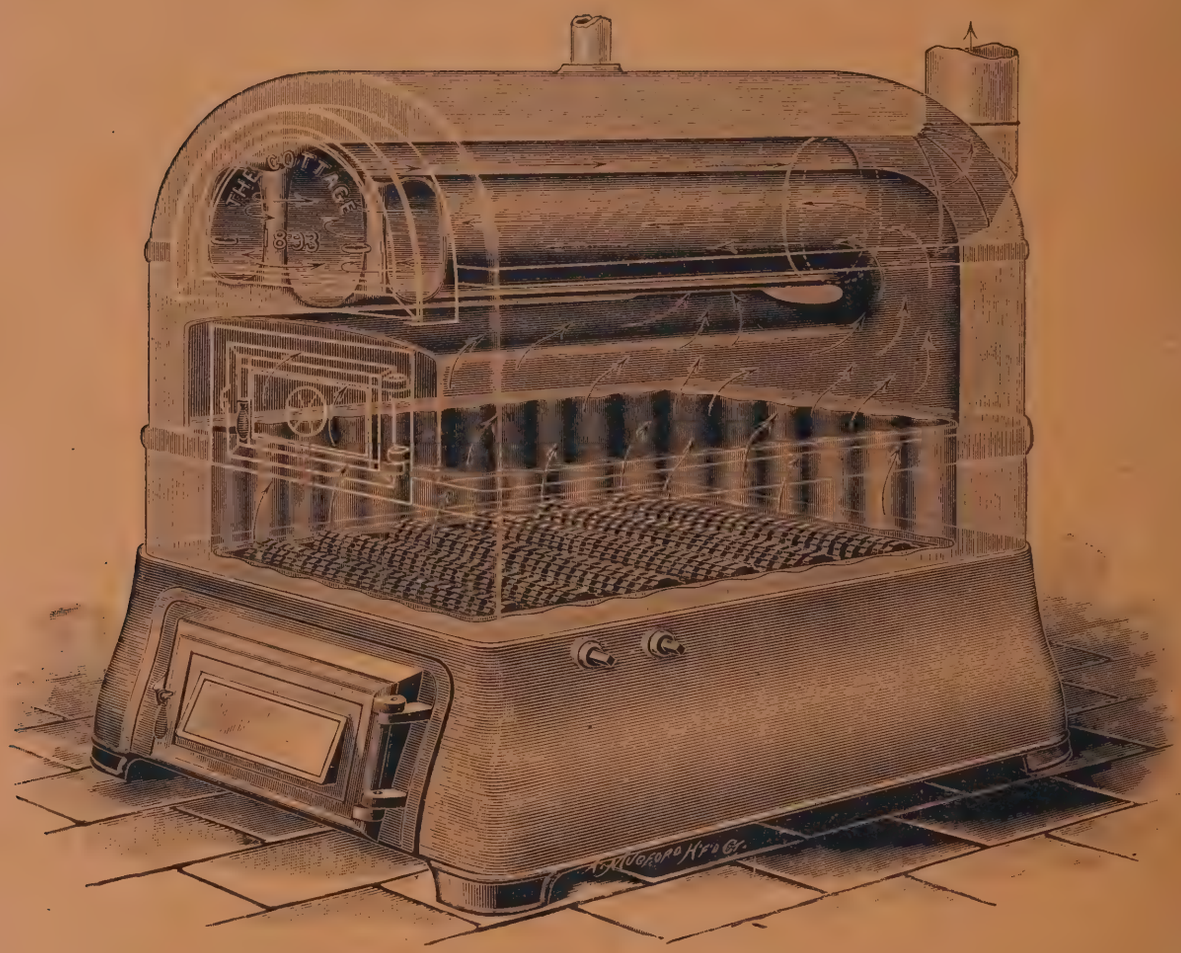
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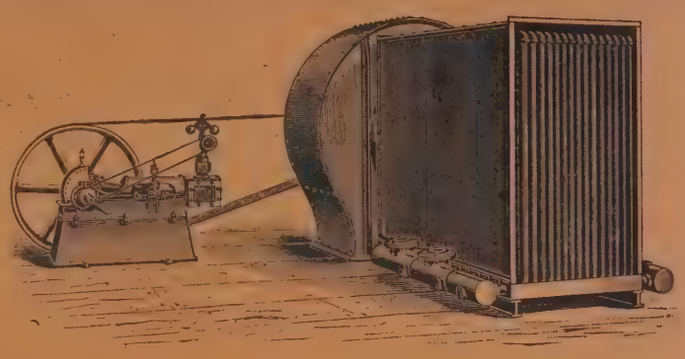
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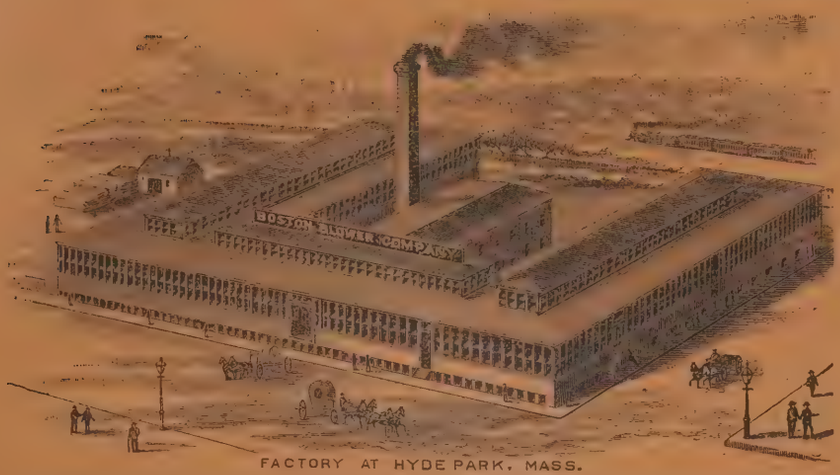
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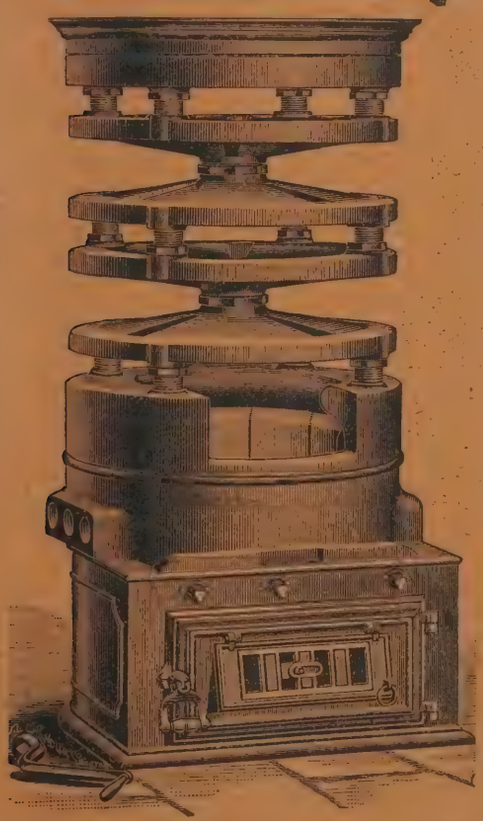
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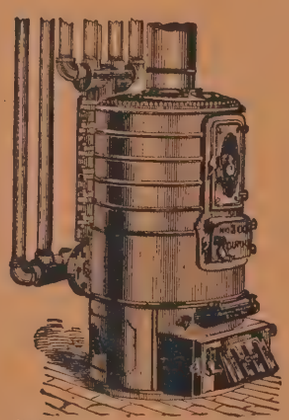
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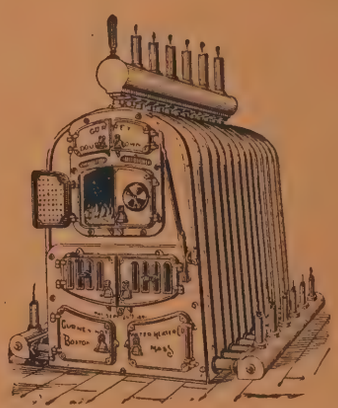
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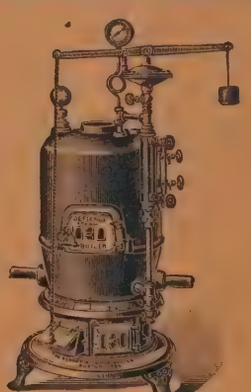
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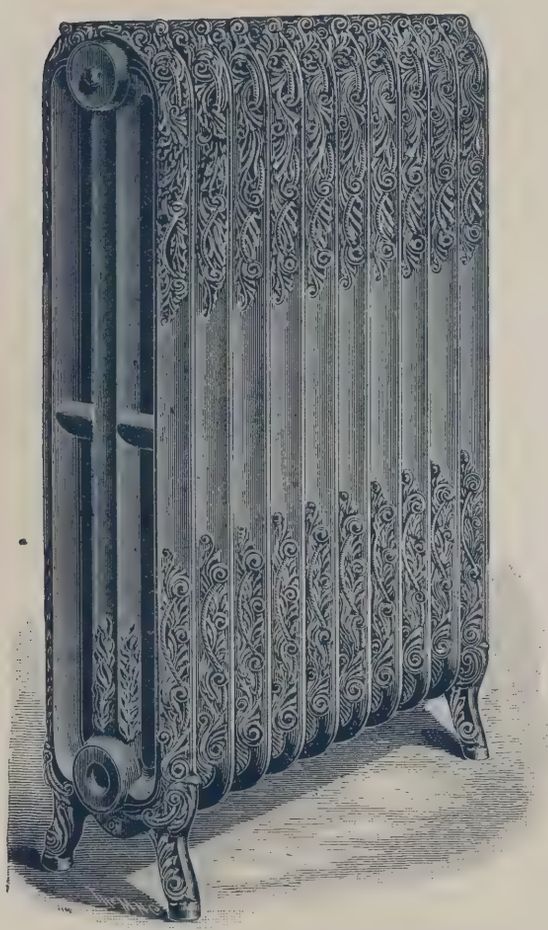
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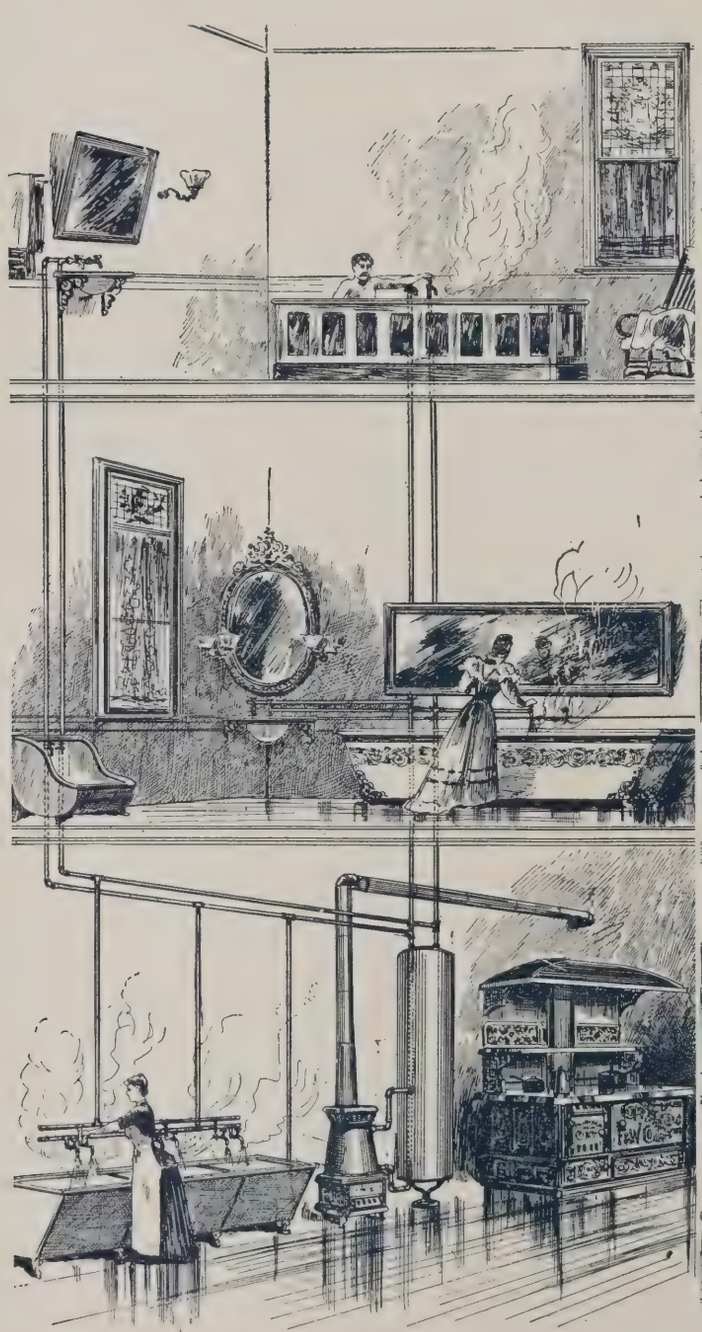
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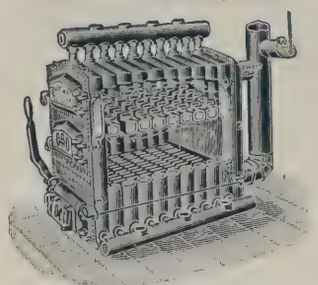
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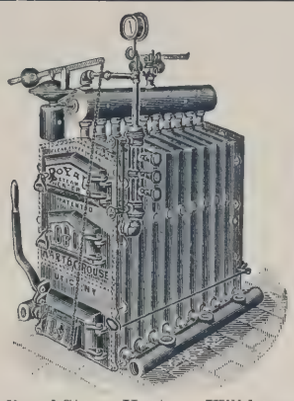
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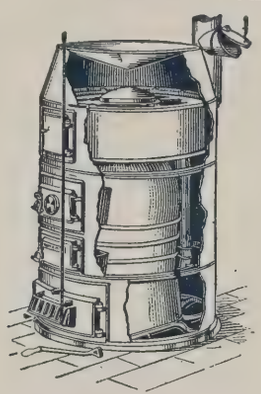
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Don't Delay Investigating These Heaters Before The Season Begins.

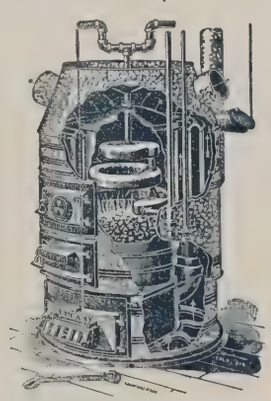


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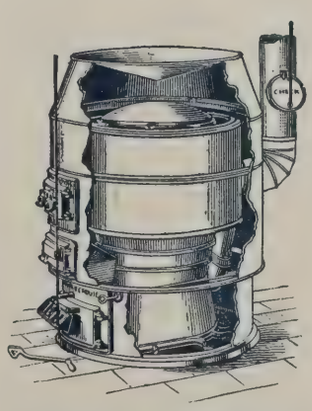
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Royal Steam Boilers.
Royal Combination Heaters.



Prince Royal Combination Heater. Most successful of its kind.

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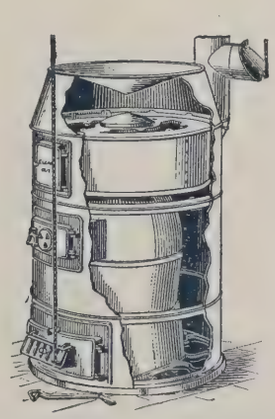
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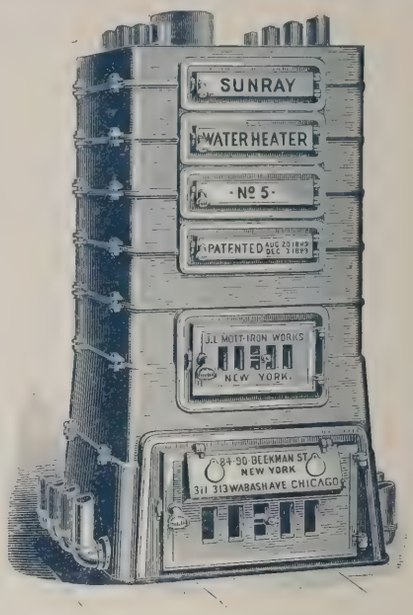
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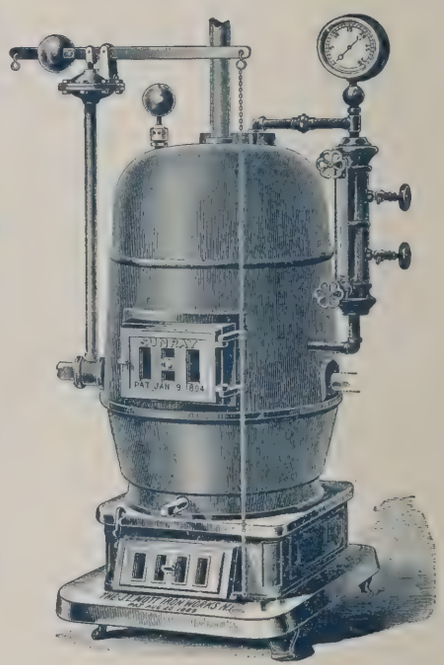
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THE ONLY WATER HEATERS AND STEAM BOILERS THAT HAVE THE PROPER CONSTRUCTION TO SECURE PERFECT COMBUSTION OF THE FUEL. THE PECULIAR CONSTRUCTION OF OUR HEATERS BRINGS THE WHOLE OF THE HEATING SURFACE INTO DIRECT CONTACT WITH THE FIRE.

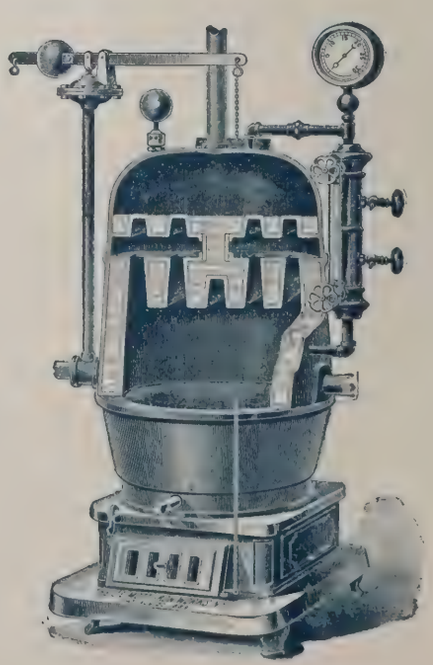


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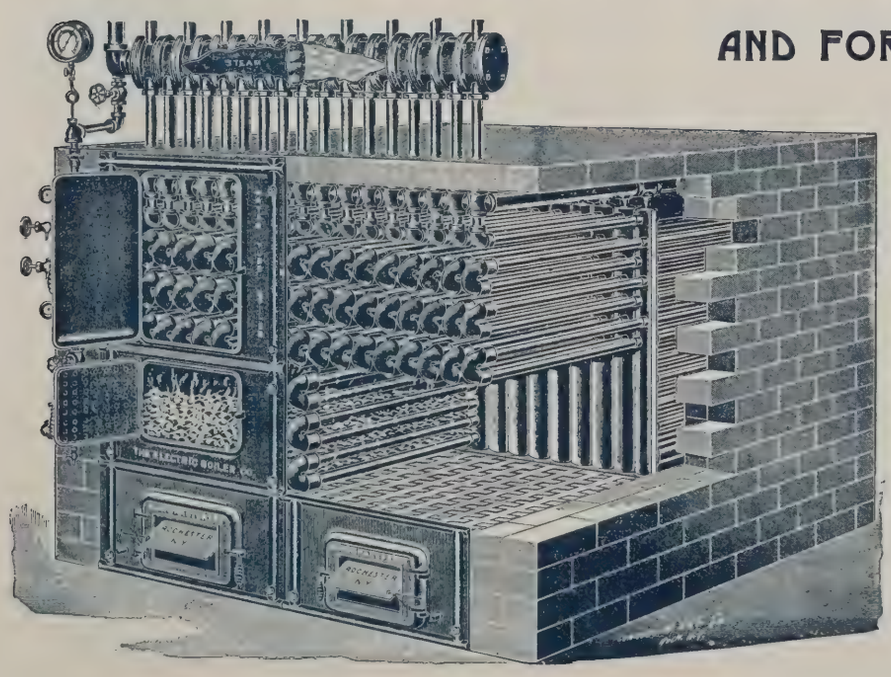
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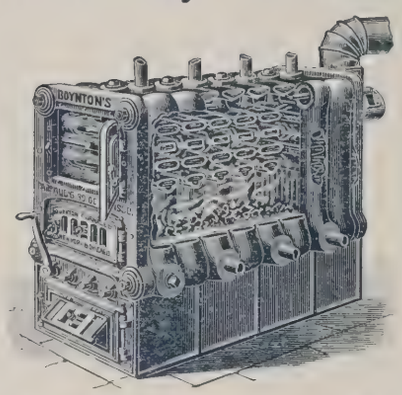
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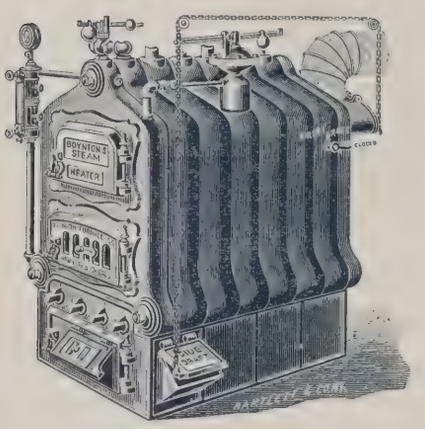
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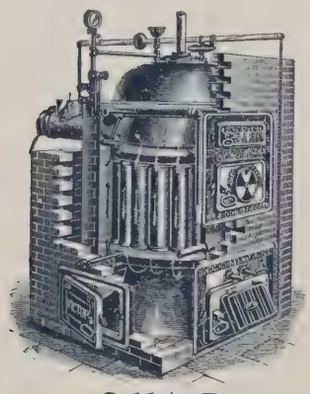
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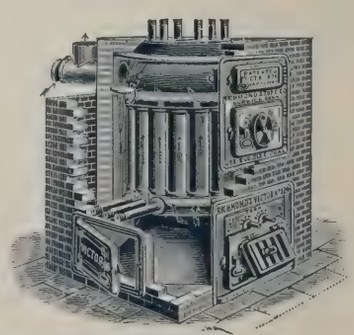


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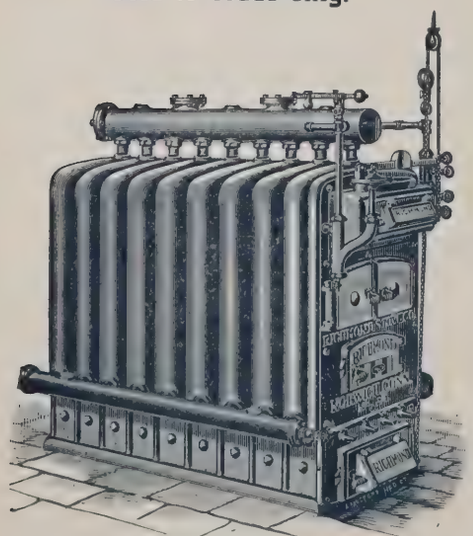
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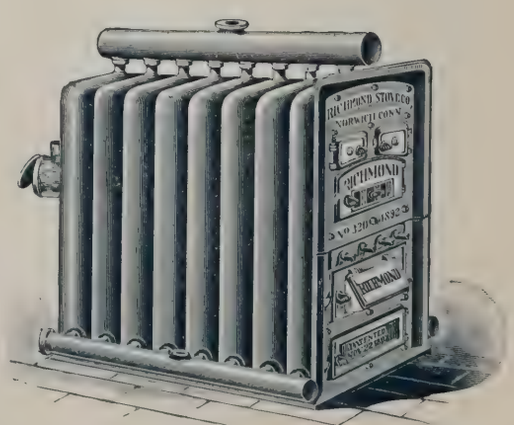
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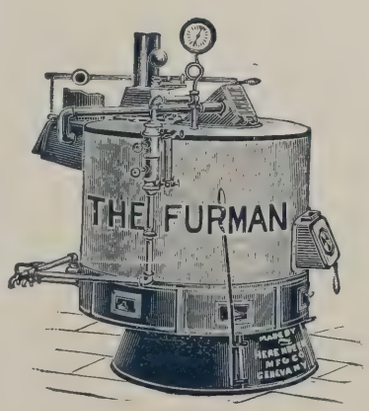
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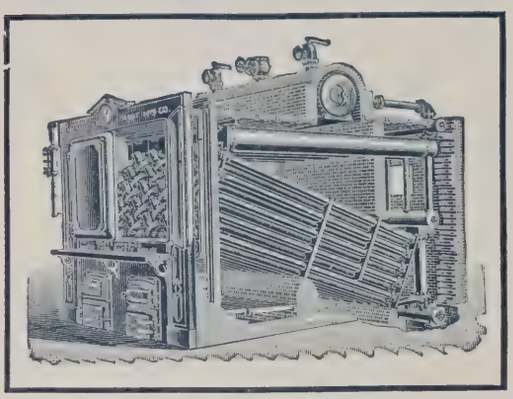
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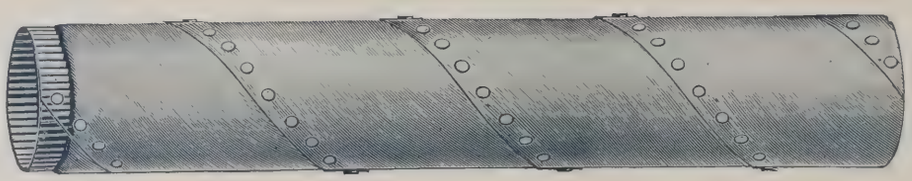
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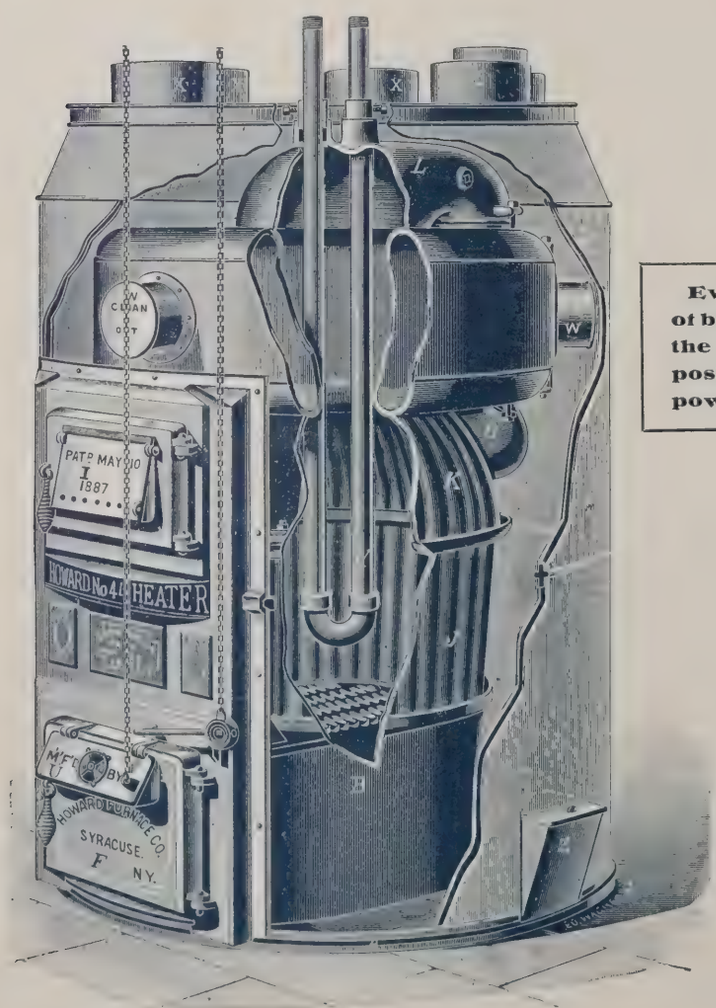
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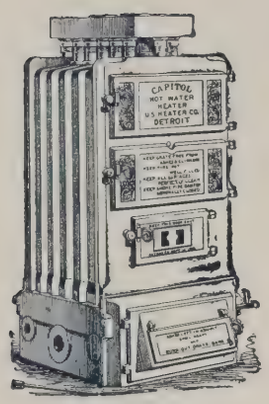
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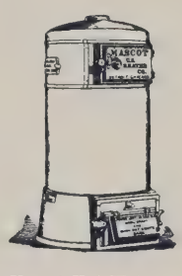
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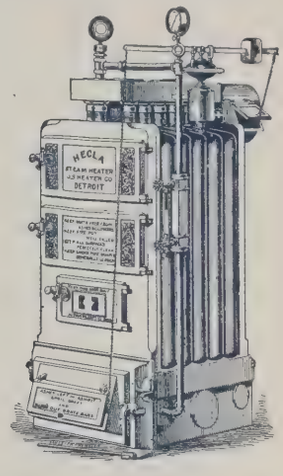
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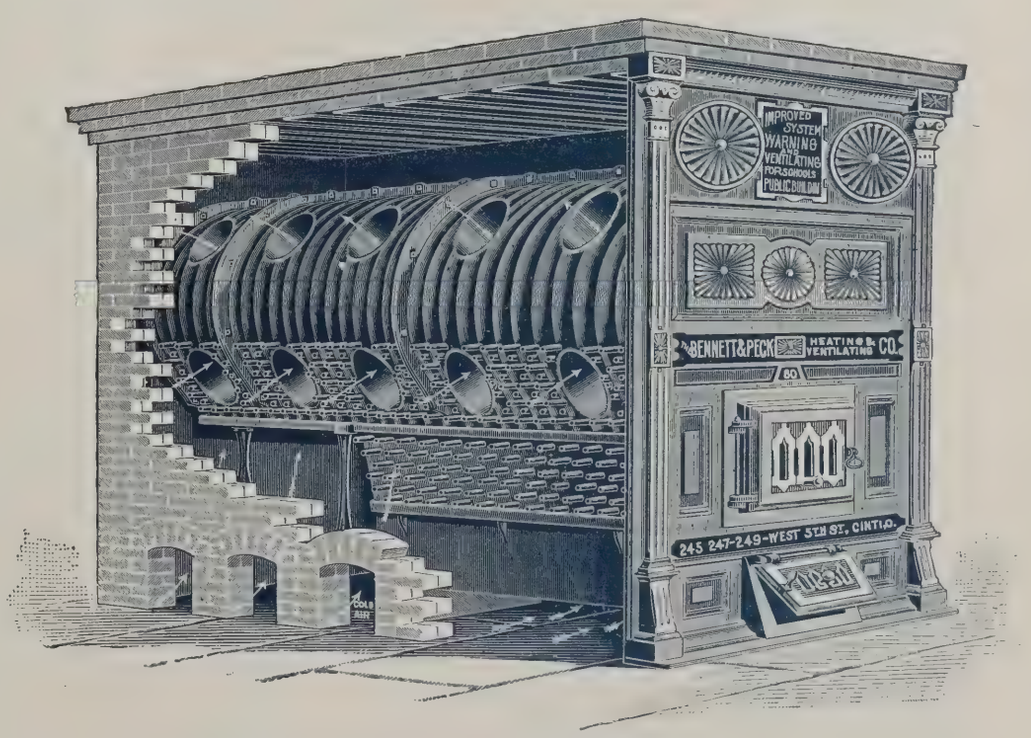
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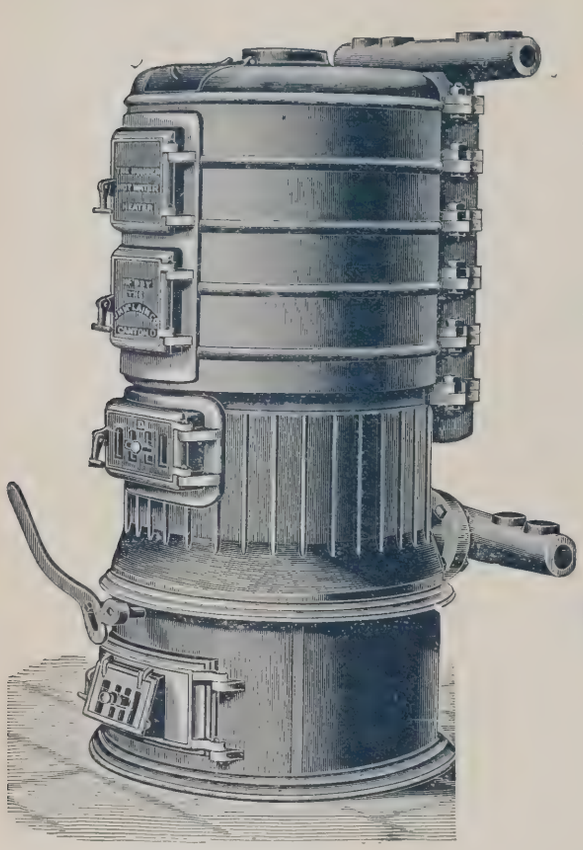
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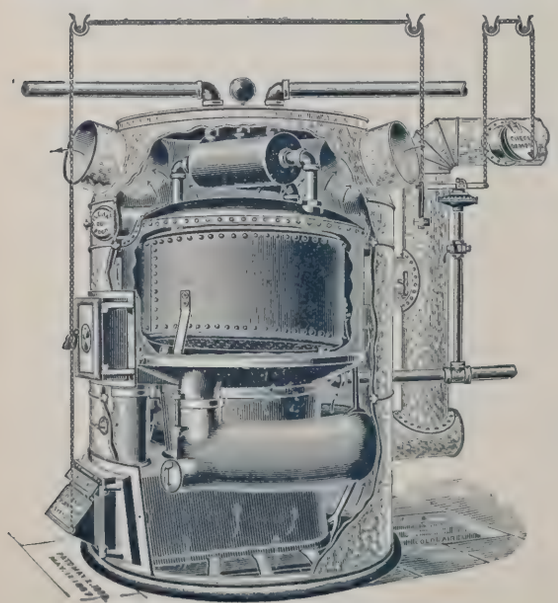
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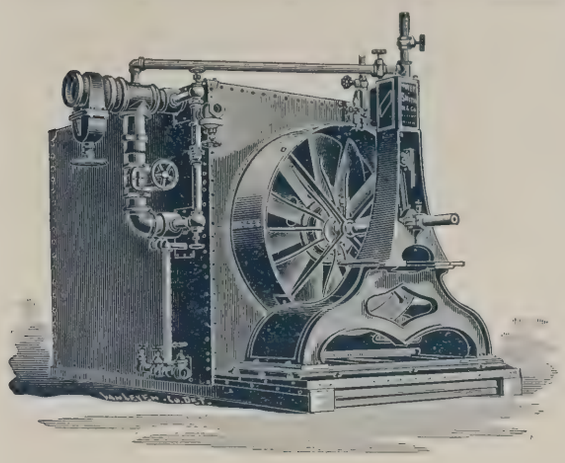
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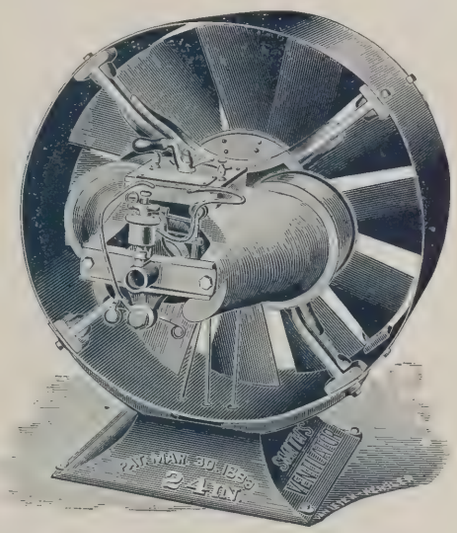
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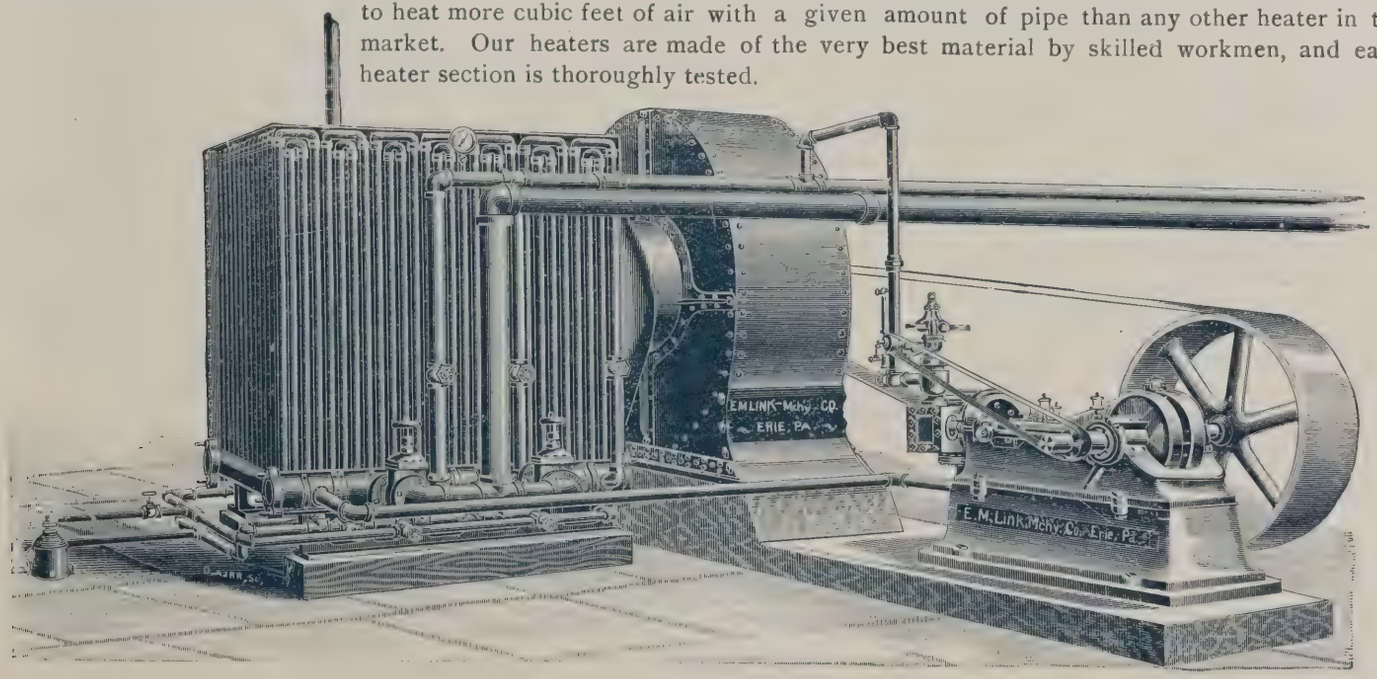
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We take pleasure in calling your attention to the accompanying illustration showing our **PATENT HOT BLAST APPARATUS,** which for Heating, Ventilating and Drying purposes has no equal. We build them having the direct attached engine, which may be preferred on account of economizing space. Using exhaust steam we will GUARANTEE to heat more cubic feet of air with a given amount of pipe than any other heater in the market. Our heaters are made of the very best material by skilled workmen, and each heater section is thoroughly tested.



Also Corliss Automatic Cut-off and Plain Slide Valve Engines Boilers, etc.

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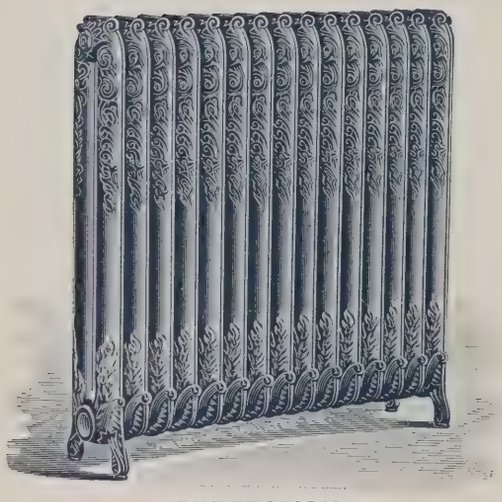
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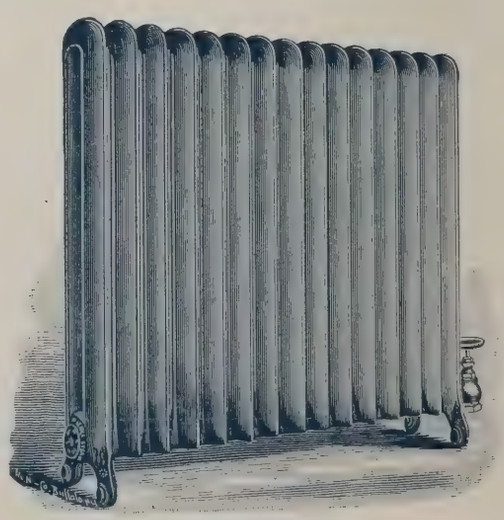
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Heating and Ventilation

NEW YORK. MAY 15, 1894. CHICAGO.
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The Teachers' College.

The college for the training of teachers, at 120th street, between the Boulevard and Amsterdam avenue, is a building of which New York city may justly feel proud. It reflects great credit upon the architect who designed it, Mr. William A. Potter, 160 Fifth avenue, and upon Alfred R. Wolff, consulting engineer, Fulton Building, who designed the excellent system of heating and ventilation, which is one of its prominent and most important features.

The heating is done by a combination of a mechanical indirect with a direct system, the former having a capacity sufficient to maintain an even temperature of 70 degrees in all the rooms in zero weather with a steam pressure in the heating main of not more than five pounds per square inch; direct radiation of the Bundy pattern, manufactured by the A. A. Griffing Iron Co., Jersey City, N. J., being placed in the rooms so that their temperature may be varied to suit the wishes of the occupants and also to take care of the loss of heat through walls, glass, floor surface, etc.

Steam for heating and power purposes is supplied by three Babcock & Wilcox boilers, two of which are set in one battery, the third being set separately. The boilers are fitted with Mahony grate bars, and are so arranged that the escaping gases enter the chimney at a temperature less than 400 degrees. The flues leading from the boilers to the chimney have an internal cross sectional area of 7½ square feet for the separate boiler, and 16 square feet for all three combined, and are so arranged that each boiler has an ample draft when operated alone or in connection with the others. Three Monitor pattern Nathan injectors, made by the Nathan Manufacturing Co. of New York, are so connected to the boilers that each injector can be operated from and feed either of the three boilers at will.

Three 6 by 4 by 6 inch and one 10 by 6 by 10 inch Worthington duplex steam pumps are used for feeding the boilers, for house purposes, and in connection with the pump governors. The larger pump is used for house purposes, but is so cross-connected with one of the smaller pumps that either of the two or both can be used at will. The three smaller pumps are so cross-connected that either one or the other, or all, can be used at will for feeding the boilers or in connection with either of the pump governors. The water connections between the pumps and boilers are so arranged that the water can be fed to the boilers either direct or through the feed water heater. The water of condensation from the entire heating system is returned to the boilers, the pumps returning it being provided with two Kieley patent automatic pump governors.

The blow-off pipes from the boilers, and drips from engines, pumps, pipes, etc, are connected to a blow-off tank 3 feet in diameter and 8 feet long. A 2½-inch discharge pipe connects the tank with the sewer, and a 2½-inch vapor pipe leads up through the boiler chimney stack.

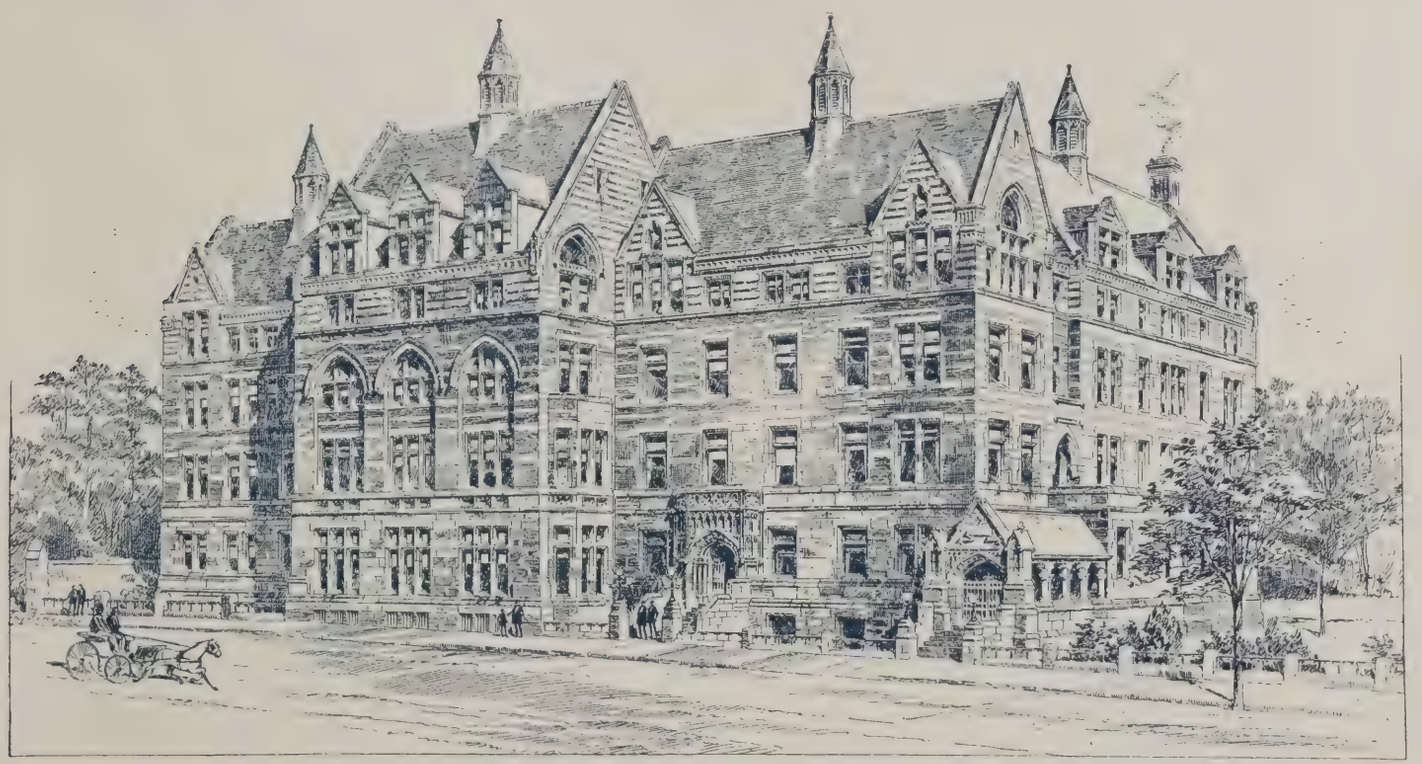
Two No. 4 Nathan ejectors are provided, one for discharging water from the blow-off tank into the sewer and the other for drainage of boiler vaults or other use.

For the hot water supply two tanks, each 3 feet in diameter and 6 feet long, are provided, being fitted with an emptying pipe to the blow-off tank.

A large Berryman feed water heater is so connected and arranged with a by-pass and three valves that the exhaust steam may pass to the roof either with or without passing through the feed water heater, a similar by-pass and valves being arranged for the water connections so that the boilers may be fed by passing the water through the heater or not, as required.

At the point where the branch to the feed water heater is taken from the exhaust main is placed a 12-inch grease extractor for removing the oil, grease, etc., from the exhaust steam.

In the high pressure connection leading to the heating main is placed an 8-inch Kiely reducing valve, around which a by-pass is provided, so that the steam may enter the heating stacks, radiators, etc., with or without passing through the reducing valve, and so that



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it may be removed for repairs when required.

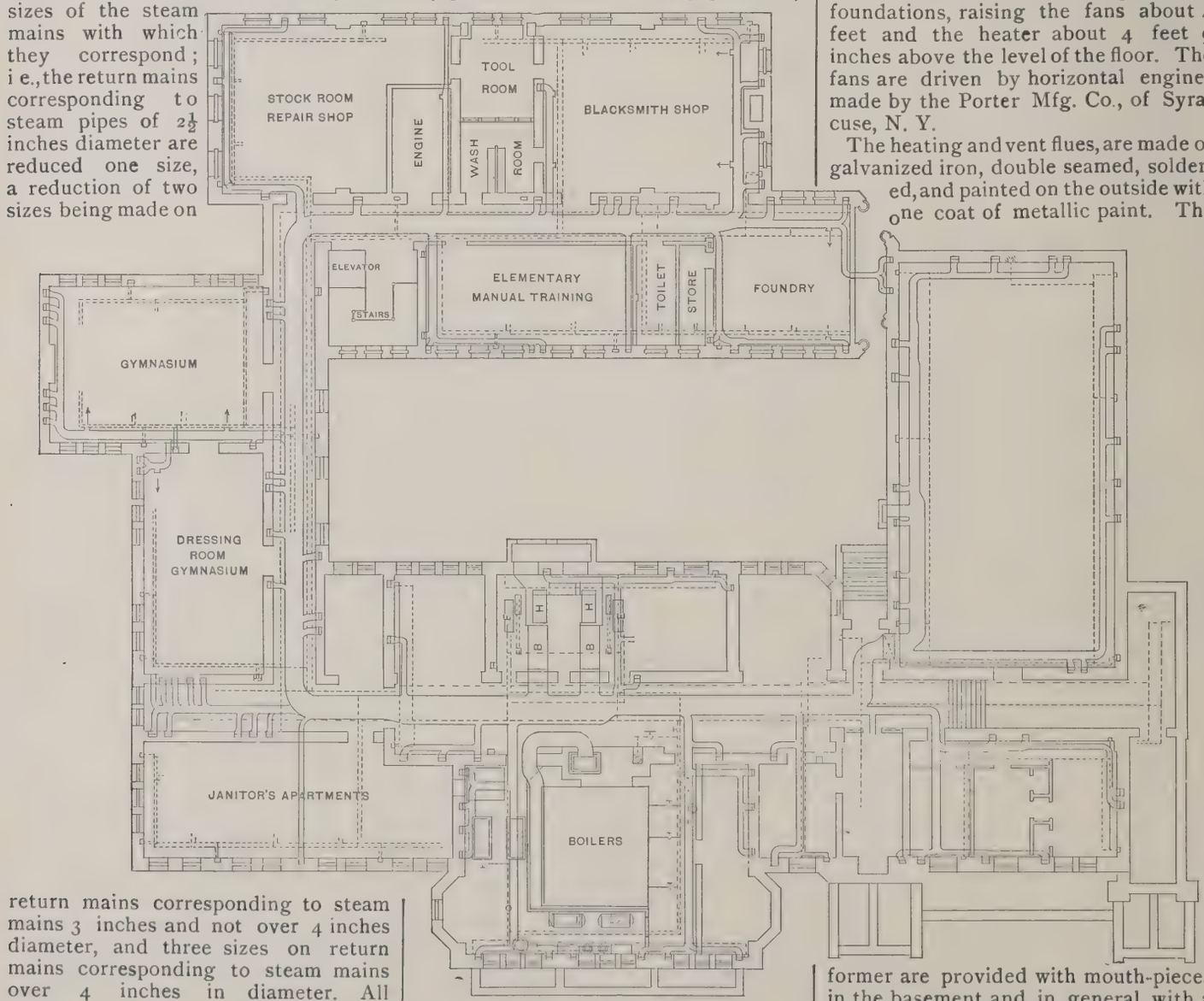
The heating main, with an initial diameter of 10 inches near the boilers, is gradually reduced as the distance from the boilers increases, care being taken that the area provided is in all cases ample for easily and noiselessly supplying the heating stacks, radiators, and risers with steam without any reduction of pressure.

At the extreme end of the steam mains, and at various intermediate points, as well as from the foot of each steam riser, drip connections, with valves, are provided to drain off the water of condensation collecting in the mains and risers, discharging it into the return mains.

Ample provision is made for the expansion and contraction of the piping, which is supported or suspended with clamps, chains, or hooks, according to circumstances.

The return mains, which are connected with the pump governor, take the same course as the steam mains, their size being determined by the sizes of the steam mains with which they correspond; i e., the return mains corresponding to steam pipes of $2\frac{1}{2}$ inches diameter are reduced one size, a reduction of two sizes being made on return mains corresponding to steam mains 3 inches and not over 4 inches diameter, and three sizes on return mains corresponding to steam mains over 4 inches in diameter. All branches to and from risers and returns of radiators, steam coils, etc, are provided with valves in the basement so as to be under the control of the engineer. Branches from the 4-inch flanged outlets in the drums of the large boiler and from the 5-inch flanged outlets in the drums of the small boilers are connected into a 9-inch power main, from which branches are taken to the several steam engines and pumps, hot water tanks, etc., the steam and exhaust connections to each engine and pump being one size larger than the opening through which the steam is respectively admitted or exhausted. Each branch has a separate shut off valve, the boiler connections being so supplied with valves that either of the boilers alone, or in connection with any of the others, or the three boilers jointly, can be used at one time for the steam supply.

The exhausts from the electric light and blower engines, the elevator and other pumps, are all connected into a 12-inch main exhaust header which connects with a 12-inch vertical exhaust pipe leading to the roof, where it is provided with a galvanized iron exhaust head, from which the water of condensation is discharged directly into a leader. The exhaust header is provided with a 12-inch Kiely back-pressure valve, and is so arranged with branches to the feed water heater (the necessary by-passes and valves being provided) that the steam can pass either through the vertical exhaust pipe to the roof of the building or to the steam heating mains, hot water tanks, etc., passing through the feed water heater or not, as desired.



TEACHERS' COLLEGE.—FIG. 1.

Two steel plate pulley ventilating fans, manufactured by the B. F. Sturtevant Co., of Boston, Mass., having a blast wheel 7 feet in diameter and 48 inches wide at the inlet, are located at *B*, as shown on the accompanying basement plan, Fig. 1. They are incased in a full steel plate housing, with top horizontal discharge 48 inches square, the height of the fans being about 11 feet.

For heating the fresh air supply a B. F. Sturtevant improved corrugated sectional base heater, containing 11,616 lineal feet of 1-inch steel pipe, is provided. This heater is made in 12 sections, each section being 6 feet long inside of the jacket, the pipes standing 7 feet high above the base. The sections are arranged in three groups, forming three sides of a hollow square, each group containing four sections. Each section is four rows of pipe deep, thus making each group of the heater 16 rows deep. Each of the groups is fitted with ample steam, return, and drip connections, with valves and air valves, so that it may be operated entirely independent of any other group.

The fans and heater rest upon brick foundations, raising the fans about 4 feet and the heater about 4 feet 9 inches above the level of the floor. The fans are driven by horizontal engines made by the Porter Mfg. Co., of Syracuse, N. Y.

The heating and vent flues, are made of galvanized iron, double seamed, soldered, and painted on the outside with one coat of metallic paint. The former are provided with mouth-pieces in the basement and in general with a bottom register near the floor and a top register near the ceiling of the room to which they convey the heated air, the vent flues also having the top and bottom registers but no connection with the basement.

The main hot-air distributing ducts, connected by branches to the several tin and galvanized iron heating and hot

air registers in the basement, start respectively at the discharge outlets of the fans with an internal cross-sectional area 48 by 48 inches, and unite to form one duct 72 by 72 inches.

All the distributing ducts, properly

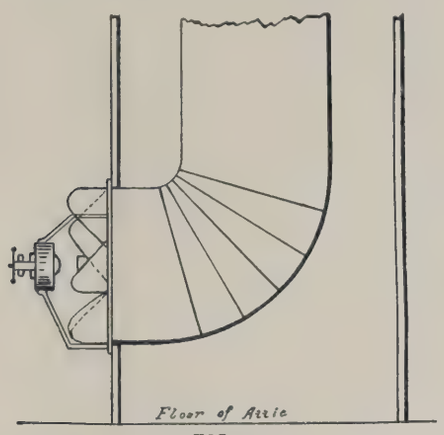


FIG. 3.

stayed, are made of the best bloom galvanized iron, and are elevated and strongly suspended, so as to afford the greatest possible head room. Dampers and deflectors, with quadrants indicating their position, are used on the main branches of the main duct, and also on single branch connections, where required, so that the supply of air can be partially or entirely stopped.

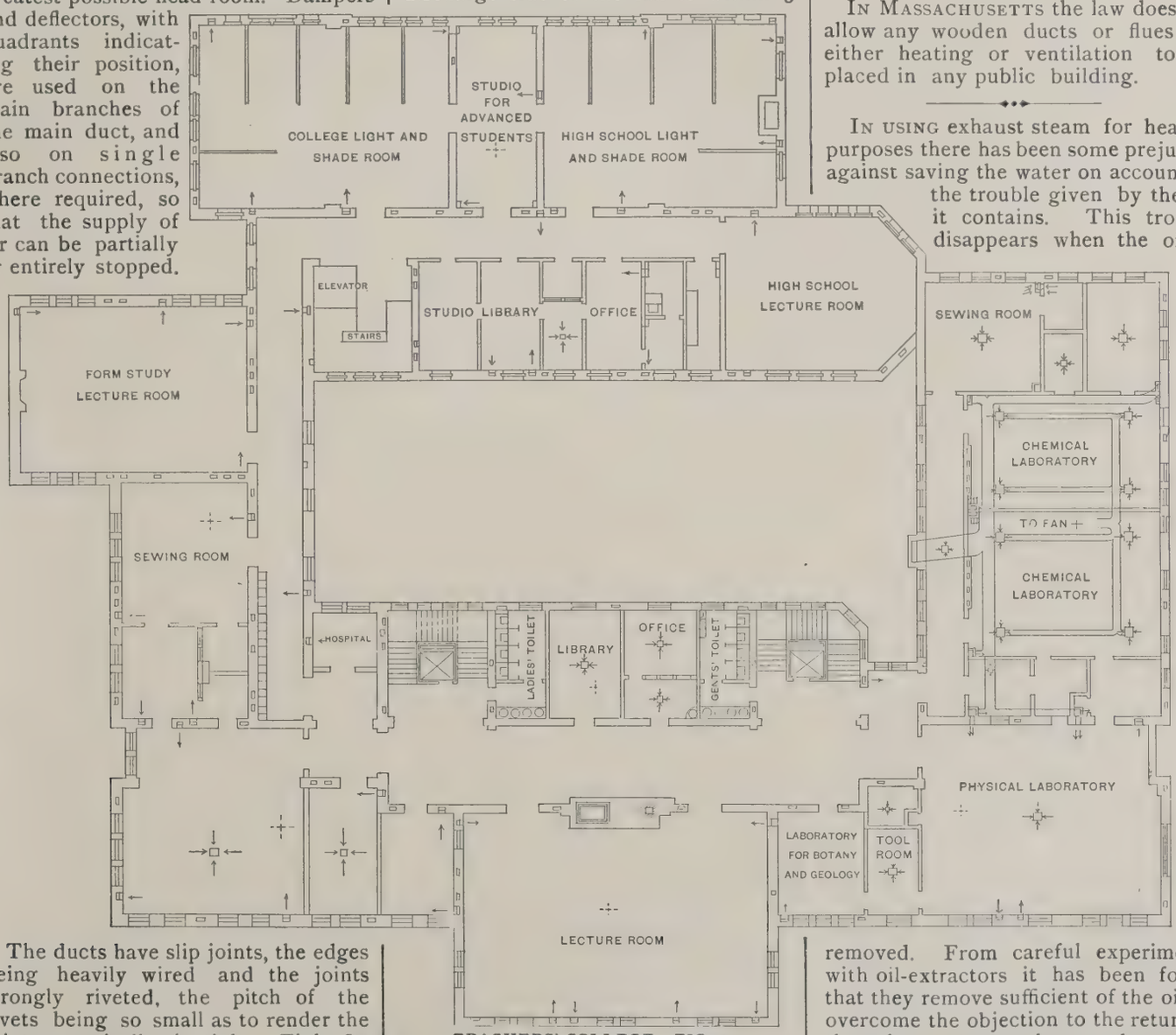
The ducts have slip joints, the edges being heavily wired and the joints strongly riveted, the pitch of the rivets being so small as to render the joints practically air tight. Tight fitting doors, which serve as manholes, are provided wherever required, while bends or turns are rounded or curved to cause an easy flow of air.

For removing the required volume of air necessary for the ventilation of the rooms, four Blackman exhaust fans, manufactured by Howard & Morse of New York, each 48 inches diameter of wheel, with four direct-connected C. & C. motors, are provided for exhausting the attic spaces in which all the vent flues and the ceiling registers of the fourth floor discharge.

One fan is secured to each of the four octagonal cupolas, clearly shown in the elevation on page 1, through which the foul air is exhausted into the atmosphere.

Each electric motor is arranged to drive its fan at various speeds (250, 350, and 400 revolutions per minute) without heating its parts more than 40 degrees above the surrounding air. The circuit of each moter is entirely independent of the lighting system, the electric wires being connected to separate switches on the switchboard in the dynamo room.

As shown by Fig. 3, the fans are placed near the floor of the attic, a galvanized iron elbow and pipe, 48 inches in diameter, leading from the discharge side of the fan to within 3



TEACHERS' COLLEGE.—FIG. 2.

feet of the roof, where it connects with a 48-inch copper pipe, which extends 12 inches through the floor of the cupola.

The vertical risers, returns, and air pipes are connected to steam, return, and air mains in the basement, each riser and return being provided with valve in the basement for control. As far as possible radiators are placed above each other on the several floors, each riser supplying not more than two radiators on each floor. In general all risers are 2½ inches to the first story, 2 inches to the third, and 1¼ inches to the fourth. Returns are one size less than risers, while the air pipes are ½ inch for their entire length. Risers and returns in exposed positions as well as the feed water heater, hot water and blow-off tanks, grease extractor, pump governors, smoke connections, and hot air distributing ducts, are covered with Keasbey magnesia sectional non-conducting covering, made by the Keasbey & Mattison Co., of Ambler, Pa., with moulded fittings canvass jacketed and banded, the canvass being painted with two coats of fire-proof paint.

Messrs. G. A. Suter & Co., 139 South Fifth Avenue, New York, were the contractors for the steam power, heating, and ventilating plant.

In Massachusetts the law does not allow any wooden ducts or flues for either heating or ventilation to be placed in any public building.

In using exhaust steam for heating purposes there has been some prejudice against saving the water on account of the trouble given by the oil it contains. This trouble disappears when the oil is removed. From careful experiments with oil-extractors it has been found that they remove sufficient of the oil to overcome the objection to the return of the exhaust steam, when condensed, to the boilers. The boiler insurance companies are recommending the use of oil-extractors where the exhaust steam is not wasted, and consider it perfectly satisfactory. It should be said that an intelligent engineer adds largely to the security the extractor affords.

Warming and Ventilation.—III.

Geo. W. Kramer

The importance of good ventilation is greater than that of warmth, as we can protect ourselves against cold by extra clothing, but how protect ourselves against bad air?

The mischief done by the latter is not realized as it should be. It is estimated by eminent authorities that this is the controllable cause of two-fifths of what may be called house diseases of the human family. No person will use food or water which has been in the mouth of another, yet the neglect to supply the necessary quantity of fresh air for ventilation forces people to breathe air which has been repeatedly in contact with the mouth, nostrils, throat, and lungs of hundreds who are more or less diseased.

It has been ascertained that a school child will vitiate seven cubic feet of air per minute, by exhalations from the lungs, extraneous transpiration, and other emanations. Take an average school room, containing fifteen thousand cubic feet of air, and accommodating about sixty pupils—the entire volume will be rendered unfit for use in forty minutes. What will be the condition at the end of the day or week if there is no provision for renewal? Every hour the air becomes more noxious, until the atmosphere becomes infectious and sickening.

Is not that a costly and criminal economy which will not only sacrifice our own health, but that of the helpless ones entrusted to our care? Who can wonder that the human race is degenerating physically, when millions of lives are sacrificed purely for want of care as to the primal necessities of our being? Air in a *normal condition as provided by nature* is considered best adapted to our requirements. Our higher civilization creates conditions which produce results that are not natural. For instance, we erect houses for shelter and for assemblage; they must be tightly built to protect us from inclemencies of the weather; for our comfort we must raise the temperature, then respiration and combustion combine to render this atmosphere noxious, resulting in diseases, debility, etc.

Providence has wisely provided, however, that higher civilization would produce a cultivated intelligence, capable of discerning the unnatural conditions, their causes, and their remedies.

Warming is a luxury of civilization, but ventilation becomes a necessity. The question then arises, "What is ventilation, and how can we secure it most effectually if it is so essential?"

Perfect ventilation consists of supplying every person in an apartment with air of the same composition as that surrounding the building, removing the contaminated air by some means, and *maintaining* this condition without unpleasant currents, and at such temperature as is found most agreeable. As such conditions are rare, although not impossible, it is not surprising that skepticism should prevail, and that we should continue to endure what we think cannot be remedied.

Strictly speaking, heating has nothing to do with ventilation. There is relation between them, as one depends on the degree of cold to be overcome, and the other upon the number of persons to be provided with pure air. Yet no scheme of warming should be considered without ample provision being made for maintaining a pure atmosphere.

Nature is the best physician; remove the cause and the cure follows. It is a fallacy to suppose that the noxious effects of bad air in the lungs can be counteracted by pouring nauseous drugs into the stomach.

Respiration is the first and last act of life, and one of the most essential. Understanding the true principle of respiration, we can realize the necessity of at least an honest effort to secure *perfect* ventilation.

In all work there is a tendency to wear out, or render unfit for service, some parts of the body. Parts losing their vitality—those worn-out particles or molecules—must be removed or disease will follow. An eminent chemist says: "Respiration is the gentle combustion of carbon and hydrogen, analagous to that which takes place in a burning lamp." Tyndall says: "In the body the carbon and hydrogen of the vegetable are again brought into contact with the oxygen, from which they had been divorced, and which is now supplied by the lungs. Reunion takes place, and animal heat is the result. Save as regards intensity, there is no difference between the combustion that goes on within us and that of an ordinary fire."

The air we breathe in the proper state of purity consists mainly of two gases, oxygen and hydrogen, in the proportion of about one to four, with about four parts of carbon dioxide to every ten thousand, and a variable proportion of watery vapor. The maintenance of these proportions should be the primary object of ventilation. The quantity of air respired by a healthy adult is about three hundred cubic feet in twenty-four hours. When leaving the lungs this contains about one hundred times more carbonic acid than before, and is saturated with watery vapor, no matter how dry it was before.

Oxygen always acts as a destroyer. Its sole office is to tear down or break up organic compounds; its tendency is everywhere the same, and unless resisted, would completely destroy the organic world. As before stated, it feeds on the worn-out tissues of the body; and were it not for vitality—that strange and mighty force which we recognize, but do not comprehend—it would speedily resolve all organized bodies into lifeless forms. The organized world would be literally burned up, and naught left but ashes or dust. When vitality ceases to antagonize or resist, we return to the dust whence we came.

There is always a certain proportion of carbon dioxide in the atmosphere, because it is continually emitted by the whole animal kingdom, as a result of combustion and the exhalation of mephitic gases of decaying matter; yet by the law of gaseous diffusion it is so mingled with the atmosphere that it amounts to only $\frac{1}{2500}$ of its weight. The specific gravity of carbon dioxide being greater than that of air, it would settle to the bottom of the atmosphere were it not for this law. If there is not an excessive amount present it is thoroughly diffused, and we find the proportions the same in the valley as on the mountain. This law of diffusion operates as a safeguard; were it not for this the heavier gases would settle and stratify, resulting in death to those who must breathe the noxious atmosphere.

For perfect ventilation only two things are necessary: first, supply pure air in sufficient quantities; second, remove an equal quantity of foul air. You cannot do the one without the other, as two bodies cannot occupy the same space at the same time.

Ventilation should be determined by the *number of persons* to whom air is to be supplied. The maximum capacity of rooms, multiplied by the cubic feet of air required per capita, will give the total amount to be supplied. This is the only sound, scientific ground to start from. The cubic contents are not an essential factor, provided the proper proportionate height is observed. The best authorities state that 30 cubic feet per minute is the lowest amount for an adult that should be considered to maintain even a reasonable degree of purity.

The much-mooted question of where to introduce fresh and where to remove foul air should not be difficult of solution. Observe the recent report on the ventilation of the House of Representatives, wherein it was ascertained that there was 400,000 cubic feet of impure air coming up from the cellar every hour. The pure air supplied is forced through gratings in the floor, which are practically cuspidors and receptacles for cast-off matter; and decaying documents in the lower rooms, the saturation of the carpets with filth and tobacco juice, all assist in producing this alarming condition of affairs.

Pure air should always be introduced from above. The air should be breathed before it passes over our bodies; our lungs should have the first and purest.

Authorities are equally positive that foul air should be taken out above and below. Carbon dioxide is of greater specific gravity than air, but the air respired is at a higher temperature, and contains much moisture. The first tendency of this would be to rise, but cutaneous and other emanations are at a lower temperature. Besides, there are many other impurities to be gotten rid of. Ordinarily in analyzing the atmosphere, the proportion of carbon dioxide is considered the inseparable sign of the proportion of the others, many of which are equally or more noxious. Some of these are lighter, and under the action of gravity would rise. If gravity were the determining law, we could *drain* off the heavier foul gases, and the others would rise beyond our level, but there is a law, seemingly

stronger than that of gravity, governing gases, which is their tendency to *mingle* with one another in uniform mixtures; and this tendency is so strong that, if time enough be allowed, it will overcome all resistance of gravity. Foul gases will tend to accumulate at the top or bottom of a room according to their specific gravity, but the law of diffusion may counteract this.

To properly ventilate will necessitate currents both of egress and of ingress. The openings for ingress must be so located and of such dimensions that unpleasant currents or drafts are avoided, and those for egress should be principally at or near the floor, so as to remove the colder strata of air and the heavier foul gases found at the bottom of the room. Controllable provision should also be made for ceiling ventilation, for the removal of over-heated air, or the products of combustion arising from gas or oil lamps, etc. The proper distribution and proportioning of these openings and connecting ducts is the engineering problem to be met, in connection with the method adopted for the moving of the necessary volume of air.

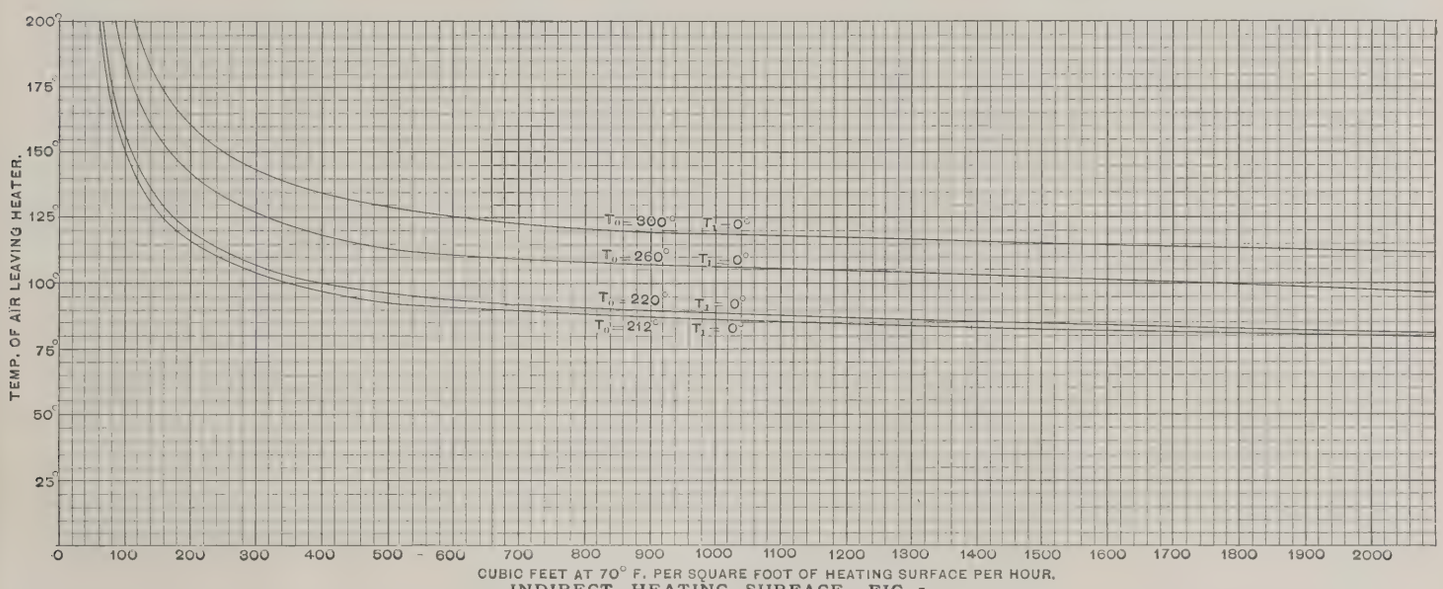
The method should be such as to produce *positive continuous* results, regardless of the atmospheric conditions, also to secure the *same* result whether air is passed at the normal temperature or artificially warmed.

Indirect Heating Surface.

J. H. Kinealy.

So far as the writer knows there has never been published a formula that will enable one to determine with any degree of accuracy the number of square feet of indirect steam or hot water heating surface that would be required to heat a given number of cubic feet of air per hour from a certain initial temperature to a required final temperature. Such a formula, if it gave good practical results, would be of immense advantage in proportioning the heating surface to the amount of air required in each system. It is very simple and easy to put in so much surface that you know you have plenty, and indeed more than is necessary, but that is not good engineering. The problem in designing a system of heating and ventilation is to provide enough heating surface, and neither too much nor too little. Too much means a useless expenditure of money, and too little means an unsatisfactory system.

The deduction of a theoretical formula involves a great many difficulties, as it is almost impossible to say whether the air is heated by radiation or by conduction. When the air surrounding a hot body is comparatively still it is heated partly by conduction and partly by radiation, but when the air is in motion most of the heat is obtained by conduction, and the amount obtained by radiation becomes less and less as the velocity of the air over the heating surface increases. Again, the size of the space in which the heater is placed exerts a very marked influence upon the rise in temperature of the air passing through the heater. I have found that theoretical formulas based upon the laws of heating air deduced from experiments made in a comparatively quiet atmosphere, give results that are too inaccurate for use when considering a fan system, or any system of indirect steam or water heating where air passes through the heater at a high velocity. Feeling the need of a formula that would give results accurate enough for designing, I deduced the following from the results of experiments made by C. B. Richards, W. J. Baldwin, J. H. Mills, and others, upon indirect heaters of various kinds, supplied with varying amounts of air per hour per square foot of surface.

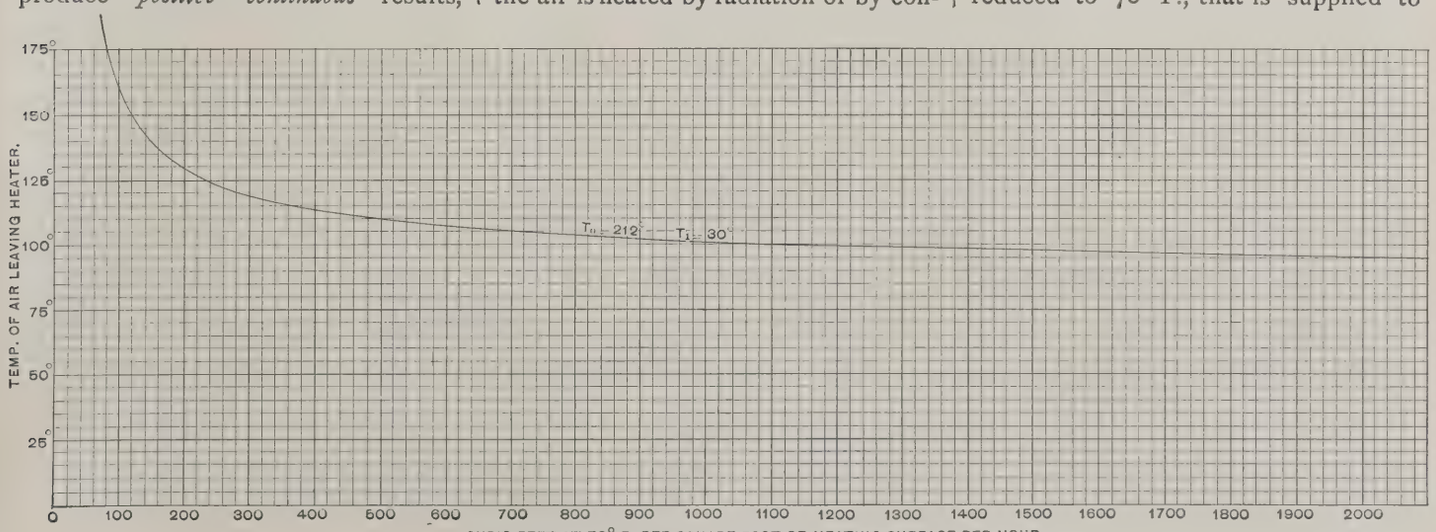


INDIRECT HEATING SURFACE.—FIG. 1.

$$N = \frac{35.04}{\frac{T_2 - T_1}{T_0 - T_1} - 0.369} \qquad (1).$$

N is the number of cubic feet of air, reduced to 70° F., that is supplied to the heater per square foot of heating surface per hour.

T_0 is the temperature of the steam or water in the heater.



INDIRECT HEATING SURFACE.—FIG. 2.

T_1 is the temperature of the air when it enters the heater.

T_2 is the temperature of the air when it leaves the heater.

The method of deducing the formula need not be discussed here as it involves mathematics that would hardly be in place. The experiments upon which the formula is based were made upon all sorts of indirect heaters, and as the formula is based upon an average of these experiments, the results obtained by the use of the equation may in some cases be slightly too small and in others slightly too large, although the error will in no case be great. No single formula ought to be expected to apply equally well to all dispositions of heating surface in indirect heaters, as the efficiency of such heaters can be varied between such wide limits by the construction and arrangement of the surface.

In order to illustrate the use of the formula, assume the following example:

The volume of air at 70° F supplied to a room per hour is 120,000 cubic feet, and the temperature of the steam in the heater is 240° F. What ought to be the number of square feet of indirect heating surface if the air enters the heater at zero and is to leave it at 100° F.?

$$N = \frac{35.04}{\frac{100 - 0}{240 - 0} - 0.369} = \frac{35.04}{0.048} = 730$$

That is, there must be one square foot of indirect heating surface for every 730 cubic feet of air at 70° F., and for 120,000 cubic feet there must be $\frac{120,000}{730} = 165$.

Sometimes it is desirable to be able to calculate T_2 when T_0, T_1, and N are known. From (1) we get (2)

$$T_2 = (T_0 - T_1)(0.369 + \frac{35.04}{N}) + T_1 \qquad (2)$$

When N is very large, $\frac{35.04}{N}$ becomes so small that it may be neglected, and then T_2 has its smallest value, which is,

$$T_2 = 0.369\,(T_0 - T_1) + T_1$$

In order to facilitate the use of the formula, I have plotted Fig. 1, the values of N and T_2 for different values of T_0, when T_1 is 0°, while Fig. 2 shows the values of N and T_2 for $T_0 = 212°$ and $T_1 = 30°$.

The use of these curves makes the solution of the problem of determining the number of square feet of heating surface required to heat a given quantity of air from zero to a required temperature very easy. The curves are of use when designing a fan system of indirect heating.

It will be noticed in (Fig. 1) that when N is about 1,500 a change of 50 or 100 in the value of N makes only a small change in the value of T_2.

While hot water heating is growing in popular favor, steam heating continues to be extensively used, especially in large buildings and in those in which steam is used for power purposes.

Measuring Air.

Speaking of the work of the Massachusetts State inspectors of public buildings, the Boston Journal of Commerce says that, in inspecting the means of ventilation in a school house, great care is taken by the inspectors to secure all the data for an accurate and intelligent report. The barometric pressure, temperature, and relative humidity of the outside air are first taken, together with the force and direction of the wind. The location of the building as to points of the compass, the position and direction of the fresh-air ducts, and location of the inlets and outlets in the rooms, are also noted. Upon entering the room to be examined, thermometers are placed in various positions, on the inlets and outlets, at the teacher's desk, at the breathing line and floor among the pupils, and near the outer door.

Careful measurements are then made of the volume of air supplied to and removed from the room by the ventilating apparatus. These measurements are made by taking the velocity in feet per minute of the air at the inlet or outlet by a standard anemometer, and then multiplying this velocity by the average working area of the opening in square feet.

For example: The inlets and outlets are usually covered by wire gratings or by ordinary register facings, which obstruct, to some extent, the flow of air, and it is seldom the case that the air is found to be flowing alike through all parts of this opening.

Proper corrections being made for these variations, and for the running of the anemometer, a very close approximation to the actual volume of air passing through may be obtained.

After keeping the doors and windows of the room closed for one hour, a test is made to ascertain the amount of carbonic acid in the air, the amount of this gas present being considered as a fair index of the other and more dangerous impurities in the air of the school room.

This test, unless great accuracy is desired, is usually made with an instrument invented by Professor Wolpert, and called, for him, a Wolpert air-tester. This instrument is very simple, consisting only of a glass test tube, on the bottom of which is a black mark, an inner tube of glass, and a rubber bulb, all of a specified size, and a stand in which to hold the tube.

The test tube is filled to a certain height—marked on the tube—with lime water, and by means of the inner tube and bulb air from the room is passed through the water until, by the formation in it of carbonate of lime, the water is rendered so opaque that the black mark or spot can not be seen.

A table, furnished by the inventor, shows by the number of times the bulk has been filled how many parts of carbonic acid there are in 10,000 parts of air.

There are various sources of error, both in the measurement of the volume of air and in determining the amount of carbonic acid, which have to be carefully guarded against by the inspector.

This has been so well done in testing the air that in a large number of tests made with a Wolpert tester at the same time that samples of air were taken for chemical analysis, the average difference between the amount given by analysis and by the Wolpert test was only $\frac{67}{100}$ of one part in 10,000.

Tests to show the circulation of the air through the room are also made, usually by means of gunpowder smoke.

The report of the inspector, when complete, gives, in addition to the outside conditions already noted, the volume and temperature of the air supplied and removed, the temperature of the room, the relative humidity of the air, the amount of carbonic acid found in it, and the results of the tests for circulation.

For determining the barometric pressure, relative humidity, and temperature, and also for measuring the flow of air into and out of the room, the very best and most accurate instruments to be procured are furnished to the inspectors by the State.

These gentlemen by long practice and habits of close observation have become very expert in the use of the apparatus employed in testing air supplies to school houses and other buildings, and they are also equally expert in regard to methods and systems of heating and ventilation, their wide experience placing their knowledge and judgment in such matters far above those of men of limited experience in such matters, or mere theorists.

It is advisable, when it can be done, says a Massachusetts State inspector of factories and workshops, to place the sanitary closets in a small annex, separated from the main building by a covered way, with doors at each end and windows or louvres between. These closets may be arranged to lead off from each story, thereby avoiding going up and down stairs, as is required when the sanitaries are in the basement. Separate closets are desirable, when they can be provided, although some improved kinds of wash-out iron flushing vaults are used to good advantage. There should also be provided automatic flushing tanks.

The boys' urinals should be provided with automatic means of flushing. The whole should be ventilated into a separate exhaust flue provided with a fan, steam pipes, or stove (shaft heater). In some cases an iron smoke pipe from the boiler may be carried up inside this ventilating flue or shaft; but there should also be provided means for heating, or causing an outflow of foul air, when there is no fire under the boiler. Ample ventilation should be provided for these sanitary rooms, and they should be well heated, to prevent freezing in cold weather.

Where an annex cannot be provided, and it becomes desirable to place the sanitaries in the basement, they should be, if possible, connected with a sewer by well-trapped pipes, and the ventilation should be from the room outward through the closets into a separate ventilating duct, with abundant power provided to cause a strong draft by either fan, steam, shaft heater, or gas burners.

Automatic Air Valves on Steam Radiators.

Arthur Goodwin

In the majority of steam heating plants, the thing about the radiators that causes the most trouble is the air valve. Such a valve is necessary, on account of the air contained in the water from which the steam is made. This being set free in the boiler finds its way through the steam pipes and into the radiators, accumulating there in such quantity as to prevent the further entrance of steam until all or a portion of it is removed.

For getting rid of the air simple pet-cocks were formerly employed, but as they required frequent attention, inventive ingenuity was applied to devising a contrivance that would work automatically, permitting the escape of the air as fast as it accumulated in the radiator and became cool. Among the earliest automatic air valves was a device containing material which had a comparatively large coefficient of expansion. This was usually in the form of a rod inclosed in a casing in such a way that the heat of the steam coming in contact with it, after the air had escaped, would cause it to expand, increasing its length and closing the aperture from which the air had escaped. The same principles, with slight changes of form and material, are employed in nearly all successful automatic air valves now in use.

Any of the automatic air valves on the market is all that is necessary or required on steam heating plants which are properly constructed and carefully operated; but slight defects in the system or careless management of the steam pressures causes more or less water to accumulate in the radiators at times, and this causes great trouble by the valves not operating to prevent the escape of the water, which consequently floods the floor, soaks the carpets, and sometimes attacks the ceiling below, discoloring the plaster or paper and occasionally causing the fall of a large patch of plastering.

Many attempts have been made to provide suitable air valves for radiators, which will prevent the escape of water while permitting all of the air to escape, but retaining the steam. The most successful of the automatic air valves designed to prevent the escape of water contain a float, in addition to the expansive material of the ordinary air valve designed to act when heated by the steam, or the warmer air in contact with the steam. The expansive material, in the greater portion of the air valves now made, consists of a mixture of vulcanized rubber and some other substance or substances, which are added with the intention of making the material harder and more lasting. This composition is sometimes termed vulcanite, and its quality varies greatly, as used by different manufacturers. This vulcanite rod, being exposed to the air and steam, becomes heated, and the expansion of the composition forces the free end against the top of the casing, thus closing the opening and preventing further escape of air or steam.

To make this device so that it will control the water also, a slender metal rod is fitted to the end of the expansive material, the end of the rod extending upwards a sufficient distance to close a hole drilled through the length of an adjusting screw in the top of the casing.

To make this effective against water, a float is added, which consists of a bell-shaped piece of hard rubber or metal, the top of which is attached to the pin that acts as a valve. This pin fits loosely on the rod of vulcanite, so that when water escapes through the opening the bell-shaped piece is buoyed upward, carrying the pin against the opening and thus effectually closing it.

This device when clean, in perfect order, and properly adjusted, will work properly and satisfactorily. But the combination necessary for its satisfactory working does not exist at all times, hence the frequent trouble where these devices are employed.

The large amount of difficulty encountered through the ineffectual working of the air valve has led many people to believe that a perfect device for such purpose has not yet been invented. This belief is justifiable, if an automatic float valve is desired that will work under all conditions, even when having unusual matter to encounter, as is the case when rust from the inside of pipes and radiators is carried through the vent. This rust never appears at the valves unless carried there by water.

It is difficult to find an air valve that will work properly under different pressures of steam (which include different temperatures also) and give continual satisfaction without occasional attention. A device for this purpose must be cleaned and oiled occasionally, at least once a year, if it is expected to give good service and remain reliable.

Some of the faults which are laid to the air valve do not properly belong there, but are due to difficulties in other parts of the system, or to the way in which it is operated. It would be almost impossible to describe here the many different systems of steam heating now in use throughout the country, and it is unnecessary in this connection, although such description might make interesting and instructive reading. It will be readily understood by all who are acquainted with steam heating systems that unless pipes and radiators are properly proportioned, and their location such as will assist the flow of water, there is sure to be more or less trouble from water becoming trapped in the pipes, radiators flooded, and perhaps leaky joints on account of water hammer.

In some systems of steam heating, if a valve is closed on one radiator it will interfere with the operation of other radiators connected with the same riser, by causing them to fill with water, and in some cases the water will have to be drawn off from the air valve before a circulation of steam can be established. In a case of this kind there is no air valve made which would work properly, preventing the escape of water and yet permitting the radiator to fill with steam. Happily such systems are not numerous.

Another cause of trouble with the air valves and the flooding of radiators is when the steam pressure is suddenly applied and there is not sufficient time allowed for the water to escape before considerable pressure comes on the radiator. This will occur if the steam pressure has been allowed to drop, so that no steam is passing through the pipes, and then a quick fire is started under the boiler and steam raised in the shortest space of time, as it would be on account of the water still being near the boiling temperature. This would be called improper management, and there is no automatic air valve that will operate properly under such conditions. On the contrary, if steady steam pressure is maintained, or the steam is slowly applied, a surplus of water will not gather in the radiator, and a float valve will not be required, if the heating system has been properly designed.

Any valve of this kind is liable, in time, to corrode or become dirty and stick. For this reason it should be taken apart occasionally and cleaned. Air valves are very delicate in construction, as they must be, for they have a delicate office to perform, and they require to be delicately adjusted in order that they shall work as required. Such delicacy may be a fault, but cannot be avoided.

On exhaust steam heating systems they usually work all right, giving no trouble whatever, and they also work well on most systems when in charge of the right kind of an attendant. It is never a very difficult matter for an engineer or a steam heating man to make almost any kind of a valve work satisfactorily where he can give it the proper attention, but where a valve is left to itself, week in and week out, it must be constructed on the best of principles or it will occasionally fail to work properly.

The double pipe system, where the steam risers run to the top of the building and there make a circuit from which other risers are carried down through the floors, and on which the radiators are connected, joining the return loop in the basement, usually gives the greatest satisfaction. In such plants water seldom or never accumulates in the radiators, and almost any kind of an automatic air valve will give satisfaction.

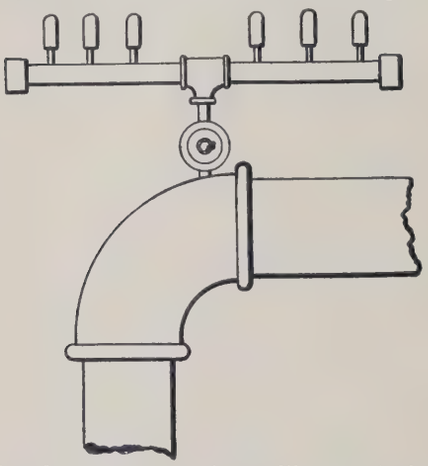
There is one difficulty which sometimes shows up in these double pipe systems, which is that an extraordinary amount of air occasionally accumulates, and by escaping into the rooms produces a disagreeable odor, which becomes a source of annoyance, so that means are sought to remove the cause of the trouble.

This problem of removing the air from the radiators and supply pipes became a serious one with the engineers of the Ashland block, Chicago, during a recent cold spell. Although each radiator was fitted with an automatic air valve the operation was not satisfactory, as the large amount of air which escaped from the pipes carried

sufficient odor to make its presence disagreeable to the tenants. To overcome the difficulty, the device shown in the accompanying illustration was designed and put in operation, at the top of the main risers, at about the highest point. The elbow was tapped near the top and fitted with globe valve and branch pipes having the ends capped. These branches were drilled, tapped, and six air valves placed in position, nearly as shown in the cut.

In the steam distribution in this building the risers extend upward nearly to the roof, from which point branches are taken off and the steam carried downward to the radiators. The device shown removes from the pipes all air which is set free by the ascending steam, and leaves less work to be performed by the air valves on the radiators, consequently less foul air reaches the rooms.

Six air valves, of the automatic kind, were used in the case mentioned, because none of larger capacity were at hand, and as the attempt was but an experiment. The elbow at the top of



the riser was near the ceiling, and the connection for the air valves had to be tapped in the side of the ell; but its efficiency, even in such position, was shown by the large amount of air escaping at this point and which stopped the complaints about foul air. This should serve as a hint to manufacturers of air valves as well as contractors for putting in steam heating systems. But removing the air from the radiators did not prevent other difficulties, as the following will show.

The heating of this building is controlled by electrically operated devices, each room being provided with a thermostat, by which the temperature can be adjusted as desired and automatically maintained. It would sometimes happen that the occupants of a room would want more heat for the time being, and they would begin by monkeying with the thermostat, fastening the lever firmly against the contact point, which maintained open valves on the radiator. To fasten the thermostat they would often use some conducting material, such as a steel pen, instead of a match or wooden tooth pick, as they should. In placing the steel pen they would make direct contact between the two terminals, thus making a short circuit on the batteries, which would render them inoperative in a very short time. This trouble caused the engineers considerable annoyance until they had instructed each of the occupants of the rooms as to the peculiar operation of the apparatus.

The electric controlling system is very neat in design, efficient in its working, and provides for nearly all accidents or contingencies that may occur, so that when left free to operate, it can be relied on to maintain constant temperature regardless of changes of the weather; but when manipulated by unskilled hands it, like all other sensitive apparatus, is liable to disarrangement and consequently becomes more or less erratic in its operation when in companionship of strangers, or those having but a smattering of knowledge of electric principles and their applications, as is very often the case.

Ventilation and Walls.

We are becoming more and more convinced, says the Weiner Bauindustri Zeitung, that the pernicious effect upon health of humid dwellings is chiefly due to the fact that the moisture arrests the circulation of the air. Prof. Max Von Pettenhofer, the father of modern hygiene, has shown that, as regards the ventilation of dwellings, walls play a more important role than the opening of windows. As, however, our dwellings, par excellence, have for their purpose to protect us against climatic vicissitudes, it might be assumed that the porousness of the walls might counteract this object. This is, however, not the case; on the contrary, porous building materials are the best protection against rapid changes of temperature. As is generally known, air is a very bad conductor of heat, i.e., it absorbs heat very slowly and discharges it equally slowly. The more porous the building materials the larger is the volume of air they are capable of containing, and while the pores do service as ventilators, the air inclosed in them acts as a regulator of heat.

It is only of late that we have commenced when building new houses to make special arrangements for ventilation. The best of these hail from England, where generally great stress is laid upon a good ventilation. On arranging ventilating apparatus it is not sufficient to provide fairly wide ducts for the ingress and egress of air; but certain settled mathematico-physical laws have to be considered. Pre-eminently it is important to prevent the generation of draft, and, at the same time, not arrest a strong exchange of air, for which reason it is particularly advisable to connect the ventilating apparatus with the fire-place.

On building a house it is most advisable, as is the custom in England, to make the flues for the escape of air of zinc sheeting and run them up to the roof, close to a chimney or, better still, between two chimneys. The escaping air becomes, through this arrangement, slightly warmed on ascending, and escapes the quicker. One may also install an air siphon pipe, leading from the upper part of the room to the floor, and finishing behind the fire-place. However, this apparatus only acts when there is a fire.

Of special importance is the manner in which the fresh air is let into a room. If it be effected from below, it is advisable to conduct the air coming from without under the floor to the fire-place, so that on entering the room it is warmed. With this arrangement the advantage is combined that the occupants of a room are not exposed to draft, and that, even when seated close to the fire-place, no closeness is felt from the heat emanating therefrom. A pleasant, fresh warmth is diffused throughout the room. If the situation should not admit of such an arrangement, the fresh air may be made to enter about half-way up the wall, which is simplest effected through a pipe. In heating with steam or water this arrangement is in particular to be recommended, and, in order to prevent in this case the unpleasantness of a cold current of air, the heat conducting pipes should be so arranged that the air on entering the room is already warmed and cannot therefore create any downward currents.

In England, as is generally known, sliding windows are used, in which the upper half may be drawn down a couple of centimeters, but still draft be prevented by a list, or border, while fresh air may be let in by similarly opening the lower half. However, this arrangement is unsuitable in countries where there is generally a greater difference of temperature of the air within and the air without than in that country, as it generates a most unpleasant draft.

Fresh air may also be introduced into dwellings by mechanical agencies, viz., by so-called impulsors. The pure air is taken from somewhere near the house and conveyed to the ventilator, which forces it through flues into every corner of the room. The impure air escapes through fissures and openings in windows, doors, walls, and ceilings. And if, in addition, a corresponding system of exhaust flues be arranged, the effect is greater, and the division of air is under complete control. Indeed, in certain circumstances, dust may be carried away with the vitiated air. The circulation of air is effected by the fresh air entering at the top of the room and sinking downward, while the impure air, together with any falling dust, is sucked out at the bottom under the floor.

But for the ventilation of factories and workshops arrangements of a different kind are required. In such cases the main point is that in the cold season the fresh air enters the work-rooms warmed, and that the vitiated air continually escapes. Single openings conveying cold air into the room cause draft and discomfort, and are therefore generally stopped up by the work hands. However, the conveyance of fresh air into such shops may be easiest effected by running a fairly wide duct under the floor, carrying the air from without to the fire-place, which should be encircled with a mantle of sheet-iron, extending to the floor. The mouth of the air duct is situated in the space between the fire-place and the mantle. Thus the air on entering becomes warmed by the fire, and escapes at the upper end. Larger

work-shops require, of course, several fire-places, and each one should have such a duct.

The expulsion of the vitiated air is effected by the fire and the chimney. In order to effect this better, square-built brick chimneys are to be preferred to the ordinary grates, and of greater width. In this an iron pipe is fixed in such a manner that there is a space between it and the brick chimney. The iron pipe serves to carry off the smoke from the fire, while the impure air escapes through the intervening space. For this purpose a sufficiently wide opening in the brick chimney is made near the floor, and another opening may be made near the ceiling for ventilation in the summer. Both openings may be closed with valves.

Decker System of Ventilation.

In this system, which operates by exhaustion, use is made of the dead air cavities under the floors and in the exterior walls. Of the accompanying cuts, Fig. 1 is a sectional side elevation on the line 1–1 of Fig. 2, which is a sectional plan view taken on the line 2–2 of Fig. 1. Fig. 3 is a broken sectional side elevation of a wooden building adapted for this system, Fig. 4 being a broken end elevation. Air is conducted to the rooms in the usual way, i.e., through air conduits in the partition walls, extending from a source of heat in the basement to the several rooms on each floor, the air being let in through registers. The source of heat may be either a hot-air furnace, indirect radiation from boxed stacks in the cellar, warm air forced in with a fan, or, if the partition conduits are not used, warm air may be admitted by the direct-indirect method of heating.

The method of heating with air is therefore optional with the builder, but when conduits and registers are preferred, sectional register boxes (designed by the inventor) are used. These are provided with a gate, so that the act of closing the register lifts the gate, and the warm air, shut out of the rooms, passes out of the open gate of the register box, and circulates under the floors.

Use is also made of special warm air conduits, which conduct the air from

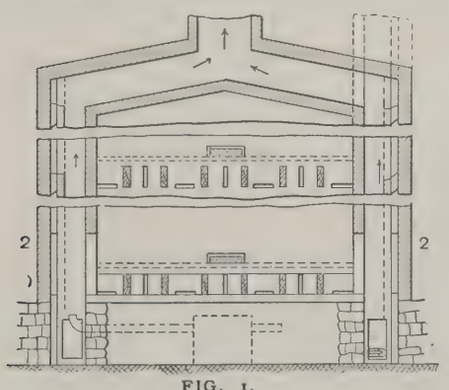


FIG. 1.

the source of heat in the basement directly to the sub-floor spaces of each floor. As many of these conduits may be carried up partition walls to the sub-floor spaces as are needed to warm the several floors of the building.

These sub floor inlets have no registers, but if the heat becomes excessive, some or all of the conduits may be shut off by turning dampers in the pipes adjacent to the heat supply.

To provide for the circulation of air and the distribution of heat under the floors, furring strips are secured to the floor joists, in staggered order, as shown in Figs. 2, 3, and 4, and on them the floor is laid, leaving air space over the joists as well as between them, so that the air may circulate in any direction.

The plan of ventilation may be characterized as a way of building, and is therefore largely architectural. To carry out this system of ventilation, the building must be constructed on all sides with hollow or double exterior walls, with an air space of, say, four inches between them, the air space being closed below by the foundation walls, and closed above by the consolidation of the two walls at the top, as shown in Fig. 1.

The walls are also united about the

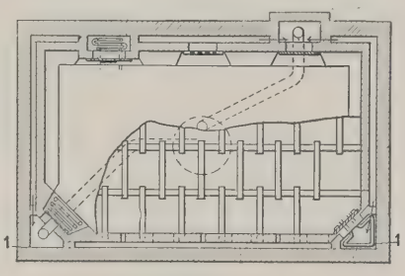


FIG. 2.

outside floors and windows, and may be further stiffened by anchor irons.

The outer wall is heavy, and contains no opening to the air space. The inner wall is comparatively thin, and has openings just above the floor line on all sides of the building. These openings are the vents for foul and cold air, which is discharged from the rooms into the general air space between the walls.

The inner wall is also provided with openings or vents below the floors, as shown in Figs. 1, 3, and 4, for the passage of air from the sub-floor spaces into the general wall cavity. These sub-floor outlets are small, because numerous, and also because they distribute the heat and retard the exit of warm air from the sub-floor spaces. The vents are made alternately vertical and horizontal, as shown, to favor the circulation of air, and in those walls that anchor the floor joists the vents occur between the ends of the joists.

All the vents for air from the rooms and sub-floor spaces open into the air space between the outside walls. That space is, therefore, the general receptacle and the only ventilating conduit for air from all parts of the building, and in order that air may pass into it shafts are provided which exhaust the air from the general air space.

The ventilating shafts are constructed in the exterior walls, and may be placed on the corners or sides of the building, as shown in Fig. 2, their location and number being determined by the size and character of the building, and whether they are to be used for chimneys as well as ventilating shafts. They are provided with lateral openings on both sides above the line of the foundation walls, and it is through these openings that the air from the general air space escapes through the vent shafts. The bases of these shafts extend down into the foundation walls, and from the cellar they may be entered through manholes, by which access is gained to the lateral openings of the shafts, through which the foul air is discharged into the open air at the top of the building.

When possible the ventilating shafts are also used for chimneys, and in that case the smoke pipe for the heater may enter the basement portion of a shaft, or the flue from a fireplace or kitchen range may enter a shaft. When the above means of rarifying the air in the shafts cannot be used, and the building is heated by steam or hot water, a coil of pipe or a stack may be placed in the base of the shafts, thus promoting the draft.

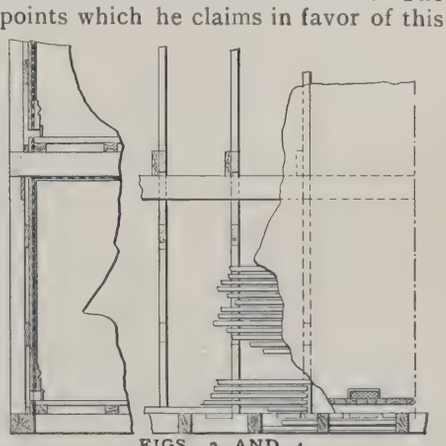
As fast as the foul air is exhausted by the vent shafts, air from the rooms and sub-floor spaces passes into the wall cavity to take its place, the outgoing air from the rooms and sub-floor cavities being replaced by a fresh supply of air from the inlet pipes.

All the air of the building above the first story must descend in the outside walls in order to enter the shafts and escape from the building. Hence, strong currents are avoided, and the outside walls are protected, warmed, and ventilated with the outgoing air and waste heat.

The system is not unlike the indirect draft in a furnace or stove, the radiating surface and heat of which is increased by passing the heated air down and about the stove, in the exterior cavities and flues, before it escapes into the smoke pipes.

This method of constructing the walls of a building, though known for many years, has not been much used. The Gould Memorial Church at Roxbury, N. Y., may be mentioned as an example.

The inventor, W. M. Decker, Box 565, Kingston, N. Y., says that the air space between the double outside walls of a building is not original with him, but that the use of the air space for ventilation is his own invention. The points which he claims in favor of this



FIGS. 3 AND 4.

system are economy in building and economy in heating, the even distribution of heat, warm floors, protected and dry exterior walls, and complete ventilation of all parts of the building, even the parts that are ordinarily sealed up.

Furnace Work.*—IV.

James N. Harding

Perhaps enough has been written in the three previous articles under this head regarding construction, both mechanical and in its relation to science, to sufficiently explain a proper and inexpensive method of warming the particular house in question with a furnace. But method is not all of the subject. Capacities and cost of the furnace, pipes, and registers must be considered before a conclusion of the subject can be reached. In the matter of capacities the judgment of the furnace man more than anything else must, in the nature of things, be his guide.

A furnace of given size will apparently heat more space if operated in the latitude of Georgia, where the coldest weather is seldom below 30 degrees F., than it will in Vermont, where the thermometer frequently indicates 30 degrees below zero.

It is just as true, although not so immediately apparent, that a furnace operating, say, for instance, on the Jersey coast will heat less space than it will in Vermont, although the thermometer in the former locality may not be so low by 35 degrees. This discrepancy is due to wind and sea air —and who can estimate the effect of these two elements in figures?

The author of any *rule* for *calculating* the size of furnace to employ for warming a given house, under given conditions, would seem to have more temerity than experience.

It has come within the observation of every observant heating man of long experience that scientific calculation to determine the size of a heating apparatus is scarcely ever so sound, far-reaching, and accurate in an abstract sense as the judgment that comes with experience. Not to say that judgment can supersede calculation altogether, but that judgment, which involves by its very nature some calculation, can accomplish much, and that pure calculation cannot succeed in the heating line.

One fundamental fact which is lost sight of much of the time is that *it is the coal and not the furnace which heats the house.* The furnace is merely employed for a convenience in which to burn the coal.

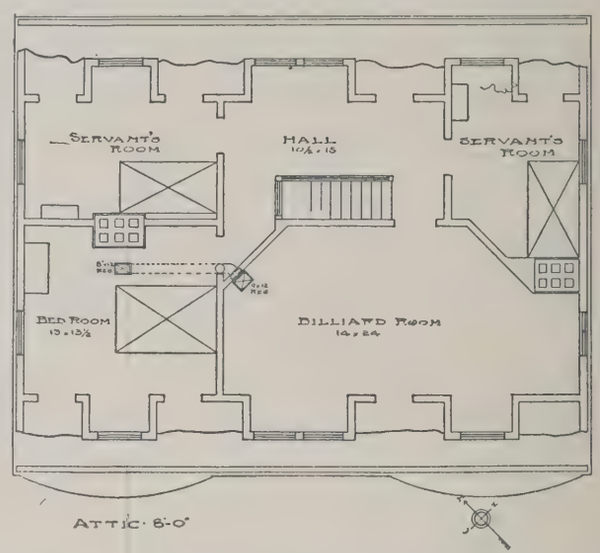
A properly constructed furnace sends about 60 per cent and a badly constructed furnace about 40 per cent of the total heat units of the fuel up through the registers—or rather into the hot air pipes leading from it. The proportion of these heat units which reaches the rooms depends in a great measure upon the manner in which the furnace man has done his work.

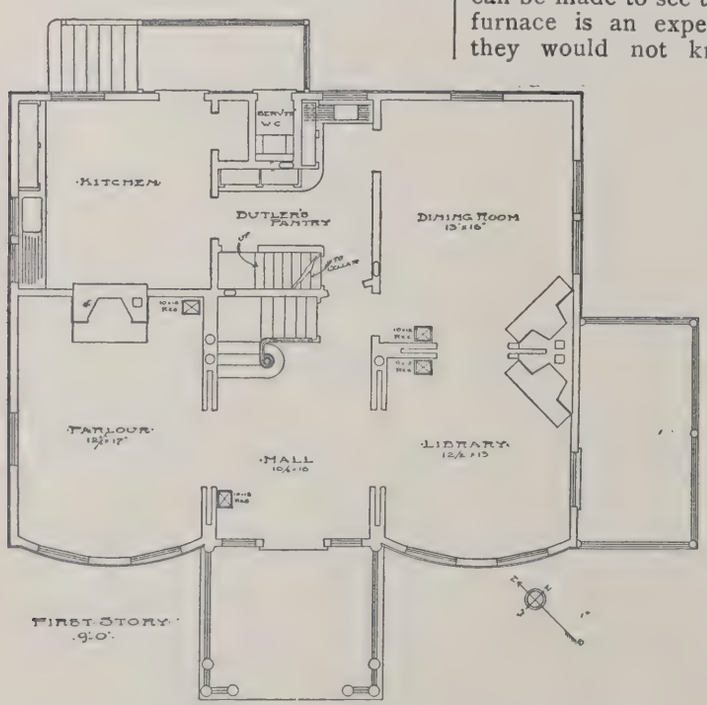
If it can be determined how much coal will be necessary to warm a house for the coldest twenty-four hours of the winter, then it simply remains to select a furnace of known efficiency which will burn that amount of coal, and to see to it that a proper smoke flue is provided.

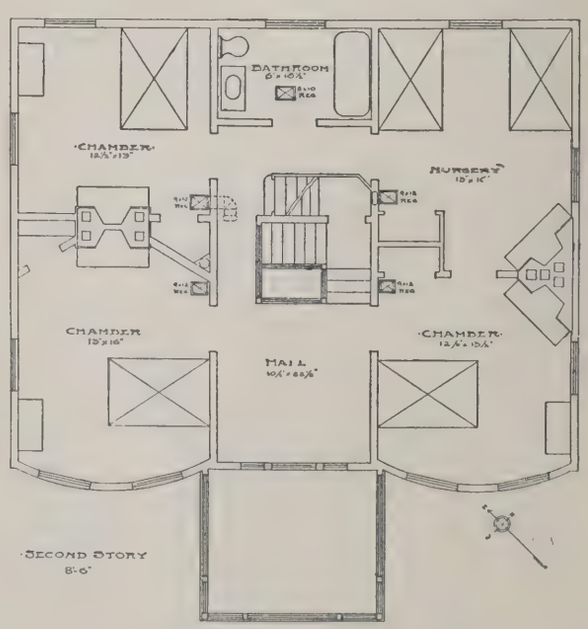
The furnace which can burn such an amount only by forcing should not be selected, except for reasons of sharp competition or a customer's penuriousness. Penurious men are sometimes provident, and with a little explanation can be made to see that an under-sized furnace is an expensive luxury which they would not knowingly tolerate. Risking a furnace of such size as to render doubtful the sufficient heating of a house in the very coldest weather is foolhardy, and will work disaster to the furnace man's reputation. The furnace man is more in need of the courage to say no and refuse an order than to accept a doubtful risk.

It is rarely if ever found that too large a furnace has been provided, although it is sometimes of such size as never to need forcing; when such is the case, economy for the customer and reputation for the furnace man are assured. "The fiend of cheapness is abroad," it is true, and is a menace to the success of the conscientious furnace man; but there is still "money in the business" for the patient, level-headed, and deserving man.

There are worthy and unworthy men, worthy and unworthy political parties. Their histories are similar: neither the worthy nor the unworthy is always on top, but the public, which will not be d—d, is the judge and is just. It will eventually send the one to the head, and the other to the "demnition bowwows." The failure of the undeserving will sometimes guarantee a greater success for the deserving. But neither political economy nor moral philosophy should be introduced too extensively here.







The house under consideration is 30 feet by 38 feet 6 inches, two stories and an attic; frame construction, well built, and not difficult to heat. For the climate of this vicinity (New York) a well-constructed furnace with a fire pot 24 inches in diameter will heat it as required; viz., to 70 degrees F. in the first and second stories and 65 degrees in three rooms of the attic in zero weather. This simple statement of fact

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may not be wholly satisfactory, but any *formula* by which the fact can be reached must have a source other than that from which this article proceeds.

The cost of a 24-inch pot furnace being ascertained, the next things in order are pipes and registers. It is not well to run the same size pipes to large and to small rooms, but the disparity should not be too great.

First story pipes should be larger than second story pipes leading to rooms of the same size, for two reasons: first, the warm air flows with greater velocity to the second story; second, the first story rooms should usually receive two-thirds of the total heat of the furnace.

Heat discharged into the first story will to a considerable extent ascend to the second story through the hall, but heat discharged into the second story will not descend to the first.

Heat discharged into the hall will not, in most houses, flow into the rooms to any extent, but surplus heat discharged into the rooms will find exit to the hall. In this house the tendency of the air will be from the hall into the rooms,—this tendency being occasioned by the activity of the fireplace flues in the rooms.

This synopsis of calculation of the relative sizes of the pipes is largely theory; the sizes of pipes indicated on the cellar plan will give definiteness to theory (N. B.—The bath room partition pipe should be 4 by 10 inches; the kitchen chamber partition pipe should be 4 by 12 inches; bath room cellar pipe, 7 inches). Floor registers should be one-half larger in area than the cross section of pipes connecting with them. Side wall and second story registers should be twice in area the cross section of pipes connecting with them. Larger registers than these are useless and a waste of money. The estimate of the cost of the whole job can be made up in many ways.

As the same fittings are called by different names in different localities, it will be well in giving one method of estimating to first give the nomenclature and definition of a few of the fittings which will be itemized.

Elbow,—an angle formed by change in direction of a continuous pipe of the same size and shape throughout; bend; bevel.

Reducer,—a connection between two pipes of different shapes running in the same general direction.

Collar,—a short sleeve affixed to a pipe or fitting for connecting two pipes or a pipe and fitting together.

Head,—a cover, top, or bottom seamed on to the end of a joint of pipe; boot; foot.

Register Casing,—a casing for protecting the woodwork around a floor register, extending from the floor downward, and finishing with a flange or wire at the ceiling.

Tee,—a collar which cannot be cut to a straight line.

Bonnet Collar,—collar in bonnet or top section of furnace casing with which the cellar or lateral hot air pipe connects.

Other fittings, such as dampers, register-boxes, etc., are too commonly so called to require definition here. For the sake of detail and to the sacrifice of brevity each pipe will be figured separately.

ESTIMATE.

FURNACE:
1 = 24-in. pot portable furnace with galvanized iron lined casings.

PIPES:
Hall: 10 ft. 10 in. pipe 2 elbows 1 collar 1 damper.
Parlor: 6 " 10 " " 2 " 1 " 1 "
Dining Room:
8 ft. 10 " " 3 " 1 " 1 "
Library: 9 " 9 " " 3 " 1 " 1 "
Parlor Chamber:
15 ft. 8 " " 4 " 1 " 1 "
" 10 " 9 " " 1 " 1 " — "
Kitchen Chamber:
7 ft. 8 " " 3 " 3 " 1 "
" 2 " 9 " " 1 " 2 " — "
" 12 " 4 × 12 in. pipe 2 heads.
Library Chamber:
15 ft. 8 in. pipe 4 elbows 1 collar 1 damper.
" 10 " 9 " " 1 " 1 " — "
Nursery: 10 " 8 " " 3 " — " 1
" 11 " 4 × 12 in. pipe 1 elbow 1 collar.
" 1 = 8 × 4 × 12 in. reducer.
Bath Room:
12 ft. 7 in. pipe 4 elbows 1 damper.
" 10 " 4 in. × 10 in. pipe 1 collar.
" 1 = 7 × 4 × 10 in. reducer.
Attic Rooms:
30 ft. 8 in. pipe 6 elb. 2 collars 1 dmpr. 1 tee.
" 26 " 9 " " 3 " 2 " — " 1 "

REGISTER BOXES:
3 = 10 × 12 in. register boxes and casings.
1 = 9 × 12 " " " " "
5 = 9 × 12 × 10 in. " "
1 = 8 × 12 × 10 " " "
1 = 8 × 10 " " "

REGISTERS:
3 = 10 × 12 in. black Jap'd reg. and floor b'd
6 = 9 × 12 " " " " " "
1 = 8 × 12 " " " " " "
1 = 8 × 10 " " " " " "

SMOKE PIPES:
12 ft. 8 in. galvanized iron smoke pipe 2 elbows.
1 = 8 in. damper 2 = 8 in. thimbles.
54 ft. metal lathing 18 in. wide.

SUNDRIES: 40 sheets 14 × 20 in. I C. bright tin for lining.
3 = 10 in., 1 = 9 in., 5 = 8 in., 1 = 7 in. bonnet collars.
1 = 14 × 32 × 36 in. galvanized iron neck flanged at both ends to connect furnace with cold air box.

LABOR AND EXPENSES:
½ day tinsmith meas. for partition pipes.
2 " " and helper putting in par. "
2 " " " setting furnace, cellar pipes and registers.
Expenses of workmen.
Cartage; crating; freight.
Incidentals.

Steam and Hot Water Fitters' Guide.

Q. 119—What is a good rule for proportioning indirect steam radiation?

A.—The following rules are given by the authorities whose names are given at the end of each rule.

In estimating the heating surface for low pressure indirect radiation it is well to nearly double what would be used for direct radiation. (Rule for direct radiation was given in the January issue.) This great increase is not necessary where the air is forced, but with natural currents it is hazardous to do with less with ordinary indirect coils.—*William J. Baldwin.*

For heating rooms by indirect radiation one square foot of radiating surface is required to each square foot of exposed glass surface and its equivalent of wall surface.—*Anson W. Burchard.*

1. Multiply the number of square feet of glass and its equivalent in exposed wall by 1.1 and the product will be the number of square feet required for indirect radiation. 2. Multiply the number of lineal feet of exposed wall by 8, for apartments having a height of 10 feet or under, and for every addition to the height of 2 feet or a fraction thereof, add 1 or a fraction of 1, and divide the product by 3, and the result is the square feet of surface for indirect radiation. (*a.*) For apartments with one wall exposed, or in which the exposed walls are equal to or less than two-fifths of all the surrounding walls, add one-fifth of the exposed wall to the lineal feet, and proceed asabove stated. (*b*) For entrance halls of rectangular form multiply the width of the exposed end by the height of the hall and by 1.1, and the result is the number of square feet required for indirect radiation.—*John J. Hogan.*

The required amount of indirect radiating surface is found by the following rule, the number of cubic feet to be warmed per minute being increased about four times: "Multiply 125 by the difference between the temperature at which the room is to be maintained and the temperature of the outside air, and divide this product by the difference between the temperature of the pipes of the radiating surface and the temperature of the room; the quotient thus obtained when multiplied by the number of cubic feet of air to be warmed per minute, and this product divided by 190, will give the number of square feet of radiating surface at the temperature stated. Then, as the difference in the temperature of the radiating surfaces above the temperature of the room is to the difference in the temperature of the radiating surface at the temperature above stated above the temperature of the room, so is the product of the square feet of the preceding rule to the number of square feet of radiation required."—*Charles Hood.*

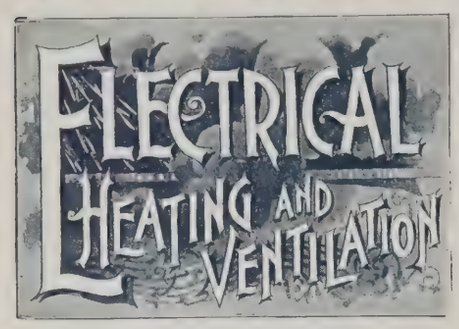
Divide the cubic feet of space, the square feet of wall, and the square feet of glass respectively by the figures given in table 1, with an air change of twice per hour, and add the quotients together and the result will be the square feet of surface in indirect radiator.—*F. Schumann.*

TABLE I.—SPACE, WALL, AND GLASS SURFACE WHICH ONE SQUARE FOOT OF RADIATING SURFACE WILL HEAT.

Air change.	Steam pressure in pounds.	Space in cubic feet.	Exposure of rooms. All sides. Wall surface, sq. ft.	All sides. Glass surface, sq. ft.	Northwest. Wall surface, sq. ft.	Northwest. Glass surface, sq. ft.	Southeast. Wall surface, sq. ft.	Southeast. Glass surface, sq. ft.
Once per hour.	1	190	13.8	7	15.87	8 05	16.56	8.4
	3	210	15 0	7.7	17.25	8 85	18.00	9.24
	5	225	16.5	8.5	18.97	9.77	19 80	10.20
Twice per hour.	1	75	11.1	5 7	12.76	6 55	13.22	6.84
	3	82	12.1	6.2	13.91	7.13	14.52	7.44
	5	90	13.0	6.7	14.52	7.60	15.60	8.04

With the external air at zero one square foot of indirect radiating surface will warm 100 cubic feet of space in wholesale stores, 80 cubic feet in retail stores, 60 cubic feet in banks, offices, and drug stores, 70 cubic feet in dry goods stores, 100 cubic feet in large hotels, and 150 cubic feet in churches.—*Charles A. Smith.*

LOOSE rivets are generally the effect of overheating. They should be cut out and new ones driven; but in case the rivets are too small for the thickness of the plates, and especially in a girth seam, the rivets must be replaced by others of a larger diameter.



Electric Heating.

BY A. M. PERE.

It is seldom that any practical problem is encountered which so easily submits to commercial calculation as does electric heating. As a rule the conditions met with in determining, *a priori*, the cost of a practical process are so involved, conflicting, and indefinite that the solution becomes largely a matter of judgment. As a consequence the widest variations in the conclusions are to be expected, and only those skilled in the particular branch concerned are competent to judge as to their relative truth. In electric heating, however, the factors which enter are so simple, their bearing so direct, and the calculations so elementary that determinations as to cost can be made not only with great accuracy but by methods that any practical man can follow and check.

What the practical man wants to know is not so much the absolute cost of a process as its cost relative to another one for which it offers itself as a substitute. I shall therefore compare the cost of electric heating with steam heating, it being left to the reader to make the necessary changes in the results to suit other methods of heating. To make the problem definite we will take the case of a house requiring 150 pounds of coal per day for heating purposes, the coal costing $4 per ton delivered.

Though at the risk of offending our heating friends, we will assume the efficiency of the heating boiler to be but 60 per cent, and that the wastes in distribution are one-sixth, making a useful heating efficiency of 50 per cent. As good coal has never less than 14,000 thermal units to the pound, that figure will be accepted, which gives us 7,000 useful thermal units for each pound of coal burned, or 1,050,000 units per day, costing 30 cents. As each thermal unit is equivalent to 772 foot-pounds, and an hourly horse-power has 33,000 times 60 foot-pounds, 1,050,000 thermal units are equivalent in mechanical units to 409 hourly horse-power of energy, which finally gives us our basis of comparison.

As electricity is a form of energy it can be measured as any other kind of energy, and expressed in foot pounds or horse-power; moreover, like all other kinds of energy, it is convertible, and may be chang d into mechanical energy by means of motors, or into heat energy through the use of resistance materials. If, therefore, an electric current in passing through an electric heater loses one horse-power of its energy, an exactly equivalent quantity of heat will appear, in the same manner that an engine shaft, if it requires one horse-power to overcome the friction of its bearings, will generate one horse-power of heat energy in the bearings. It is needless to say that this is but another statement of the law of the conservation of energy, and, in a more general form, the basis of all electrical measurements. With the principles now before us we can proceed to the comparisons.

Electrical energy for lighting is almost uniformly sold throughout the United States at the rate of one cent per lamp-hour, which is somewhat more than 12 cents per hourly horse-power. If, therefore, we had to pay the same price for electricity for heating as for lighting, the daily cost of heating the house in question would be:

With electricity, $409 \times 0.12 = \$49.08$
With steam,..... = .30

The usual cost of generating electricity in central stations is given at 4 cents per horse-power hour, which, taking all factors into consideration, is too low. Accepting that figure, however, it follows that, if supplied from a central station at cost price, the daily cost of heating the house would be:

With electricity, $409 \times \$0.04 = \$16.36$
With steam,..... = .30

It is sometimes acknowledged by the advocates of electrical heating that their method of heating a house is more costly than other methods, but that wealthy people would be willing to pay the increased cost on account of the universally admitted advantages otherwise possessed. To test this, assume that the Vanderbilt palace, in one case, is supplied with electricity from the street mains at cost, and in the other case burns one ton of coal per day, with two furnace attendants at $2.50 per day each, the coal costing $4 per ton. The increase of electricity would be in the ratio of one ton to 150 pounds of coal, and the daily cost would be:

Electricity, $409 \times \frac{2000}{150} \times 0.04 = \$218.13$

Steam $4 + (2 \times 2.50)$ = $9.00

It is doubtful if even the Vanderbilts would be willing to pay the above difference for the advantages of electric heating, but assuming that they might consider the proposition, let us see what conductors would be required to carry the current. If the heat were distributed at the same rate at all hours, that rate would be 227 horse-power; but as during certain hours a greater quantity would be required than at others, the wires would have to be calculated for the maximum amount, which we will assume to be 300 horse-power. We will further assume that the voltage will not be permitted to be higher than 200, and that the underwriters' rules in regard to heating of conductors are followed. Then, to carry the current to the distributing point would require twelve copper conductors, each one-half inch in diameter.

To return to our more modest house, suppose the owner were to pay only for the coal used in generating the electricity, costing, say, $3 per ton, and that the engines running the dynamos used two pounds of coal per indicated horse-power, which would be equivalent (taking into account the various losses between the engine and the house) to $2\frac{1}{2}$ cents per electrical horse-power delivered. Then the daily cost would be:

Electricity,.... $\frac{409 \times 2\frac{1}{2}}{2000} \times 3 = \$1.52$

Steam,..... = .30

If the electricity were generated by water power it is interesting to know at what price a horse-power would have to be supplied per year to compete with steam heating. Four hundred and nine hourly horse-power per day is the same as about 17 horse-power continuously Supposing that our steam heater were in use seven months, it would cost $7 \times 30 \times 30 = \$63$ per year, but we would have to pay the full yearly rate for the water power, as the electric current could not be disposed of during the summer months, and the plant investment would otherwise be earning nothing. Therefore, to compete with a steam furnace using coal at $4 per ton, the rate for water power would have to be: $\frac{63}{17} = \$3.70$ per year. The cheapest water privilege in America is said to be at Lockport, N. Y., where the charge is $16.90 per year per horse-power, which, of course, is exclusive of any electrical generating plant. It is said that the fixed charges at Niagara are already $8 per horse power per year, exclusive of generating plant.

As a final comparison, if electricity can be supplied so as to heat as cheaply as by steam, what will be the price of gas to compete with this electricity for lighting?

Five feet of gas will supply a 16 candle-power jet for one hour, and therefore a thousand feet will supply 200 sixteen candle-power jets for an hour. Two hundred 16 candle-power incandescent lamps will require 10,000 watts, or $\frac{10000}{7460}$ horse-power. If as cheap as steam heating, 409 hourly horse-power will cost 30 cents, or one horse-power per hour will cost $\frac{30}{409}$ cents, and the price of gas will have to be: $\frac{10000}{7460} \times \frac{30}{409} = 1$ cent per 1,000 feet. That is, when we can heat by electricity at the same price as by steam, the electric light will cost the same as gas light with gas at one cent per thousand feet. It now costs about the same as gas at $2 per thousand.

It is sometimes said by the advocates of electric heating that, owing to the facility with which electric heat may be turned on and off, a great saving in heat units is effected through its use, the heat being switched off upon leaving a room and turned on upon entering. This argument is largely fallacious, as if the walls of a room were thus allowed to become cooler, a very considerable quantity of the heat saved would be required to re-warm them, and until this was done the room would be far from comfortable for occupation.

It thus can be shown beyond peradventure that heating houses by electricity is entirely impracticable, even by water power. Moreover, if we were to get electricity direct from coal, or even direct from dirt or stones, and with 100 per cent efficiency, it would perhaps

still be impracticable; for the energy of water is free and can be converted into electricity with a loss of only about 35 per cent. In the case of water power, the cost arises from plant maintenance and attention, and in the case of free coal or dirt the same elements would enter and entail similar cost.

There are two cases, however, in which electric heat has been practically utilized— for heating trolly cars and for cooking. In the former case the heat practically only costs its equivalant in fuel, and while this is much greater than the cost of coal stoves, its convenience, the saving of two seats in each car, and the greater comfort to passengers have generally been considered to result in a balance in favor of electric heaters.

In cooking, the amount of heat utilized from the coal burned in a stove or range in actually cooking food becomes very small, perhaps not over a few per cent; on the other hand, almost all of the electric heat may be utilized, and to the best advantage. The space occupied is very small, no distressing heat is emitted from the apparatus, while by means of a thermometer and a watch, a kitchen girl may thereby accomplish results almost equal and in some cases perhaps superior to those of a French chef. This is not so true for processes which would be very expensive to carry on by electricity, but I venture to predict that the electric oven will come largely into use and work a gastronomic revolution, for the beautiful manner in which the heat can be distributed and controlled in it will lead to epicurean refinements in cooking now unknown.

Installing Electrical Heating Apparatus.

On March 26 the following specifications for the installation of electrical heating apparatus were adopted by the city electrical inspection department of Chicago:

(*a*) All arrangements for making connections to heating devices must be fixed and permanent, and the current shall not be carried beyond the permanent fixture. The apparatus must be so designed that whenever the device containing the "resistance" is removed the circuit shall be automatically broken.

(*b*) No flexible cord or wire or movable wire to be used. The wire to the permanent fixture shall be strictly in accordance with the rules for safe wiring of the same voltage.

(*c*) The permanent fixture shall be placed in a safe situation and isolated from inflammable materials; shall be on non-combustible supports, and at least four inches from the floor, or other woodwork in its vicinity, entirely composed of non-combustible material, not concealed, but in plain sight.

(*d*) The "resistance" itself shall be inclosed in a fire proof case.

(*e*) Each device or set of contacts shall be protected by a proper fusible cut-out under the regulations laid down in rules for safe wiring.

(*f*) There shall be a double-pole self-acting switch for each circuit, which shall absolutely and plainly indicate to the eye whether the current be "on" or "off."

The New York Board of Fire Underwriters has adopted the following rules for the installation of electrical heating and cooling apparatus.

ELECTRIC HEATERS, RANGES AND STOVES.

(*a*) These must be placed in safe situations, out of easy reach of inflammable materials, and separated from and supported on non-conducting and incombustible standards or bases so as to be at least 4 inches from wood work of any description or other inflammable material, unless protected by non-combustible materials, such as sheet metal and asbestos, or the like, so combined as to prevent appreciable transmission of heat, while securing full insulation. The heating wires or resistances of these heaters, etc., must be inclosed in non-combustible cases adapted to prevent accidental contact with exterior objects or material.

These electric heaters, stoves, etc., must never be concealed, but must be at all times in plain sight.

(*b*) They must have double-pole switches, cut-outs, etc., arranged as required for electric lights or power apparatus employing the same current and potential.

(*c*) The attachments of feed wires to heaters, etc., must be in plain sight, easily accessible and protected from interference, accidental or otherwise.

(*d*) Attachment of conductors to heaters, etc., must be securely made in the same manner that conductors are attached to motors or generators dealing with currents equal to those employed in these devices, and such conductors must be continuous from the heaters, etc., to the switch or cut-out, which must not be within two feet of said heaters, etc. These conductors must be thoroughly well insulated and also covered with a good mechanical protection.

PORTABLE COOKING APPARATUS, GLUE POTS, CURLING IRONS, ETC.

(*a*) The heating coils or resistances of these instruments must be inclosed in non-combustible cases, which in turn must be mounted on non-conducting and incombustible bases raising the same at least one inch from any surface on which they stand.

(*b*) These instruments must not be attached to lamp sockets, and when current of more than 10 ampères is required they must conform to the same rules as heaters, ranges, etc.

(*c*) Where currents of 10 ampères or less are required these instruments may be connected by specifically approved flexible double or twin wire conductors, provided such conductor is composed of two multi-strand conductors, each of which is insulated by a waterproof material and asbestos, while both are surrounded by a covering affording adequate mechanical protection. These flexible cords must also be connected to plug switches having double pole fuses in their sockets which will cut out the circuits if a cross connection should occur in the flexible conductor. Moreover, such plug switch must be so arranged that the plug will pull out and break the connection if an abnormal mechanical strain is brought on the flexible conductor.

The leading-in wires of these flexible cords must be connected to heaters or the like at the point of lowest temperature, and where such wires are detachable at the heater, their terminals must be arranged with female ends protected by porcelain extending at least ⅛ inch beyond the metal terminals.

If the connection at the heater is fixed, a separable double pole connector must be placed in the circuit, so that in case an undue strain is brought on the conductors the device will be automatically cut out and disconnected.

Flexible cord connections longer than 6 feet will not be permitted.

Receptacles for plug attachments must be placed at least 6 inches above the floor.

Where switches are provided they must conform to the rules laid down in Section 26 of the General Requirements.

Where a number of utensils are grouped for general cooking service, installations to be approved must be provided with slate, soapstone, or other approved slab or table for utensils to rest upon. Plug receptacles mounted on slate or other approved material shall be attached to mains running at least six inches above the working surface of the table.

Sad irons and other heating appliances that are intended to be applied to inflammable articles, such as clothing, must be arranged as above as far as connections, etc., are concerned, and must also be provided with approved attachments which will cut off current when they are not in actual use.

The leading-in wires to these forms of apparatus must be connected through porcelain connecting blocks, and the cable or cord of the same must be passed through an insulated elastic spiral or spring so arranged as to protect the same from kinking, chafing, or like injury at or near the point of connection.

These conductors must be so placed that they will at all times be at least four feet from the floor, and well protected against contact with water pipes or other possible ground connections.

The use of no flexible cord will be permitted, unless specifically approved by this board.

In placing pop valves on a boiler they ought to conform in size as near as possible to the United States regulations for marine work. This will insure ample size to deliver steam from the boiler and give a reliable valve.

A pop valve should always be provided with a relief never connected by a cord, so that it can be opened if necessary from the floor of the boiler room; and although in good practice it would very seldom need to be touched, it be should provided, to give a chance to operate the valve without climbing on top of the boilers.

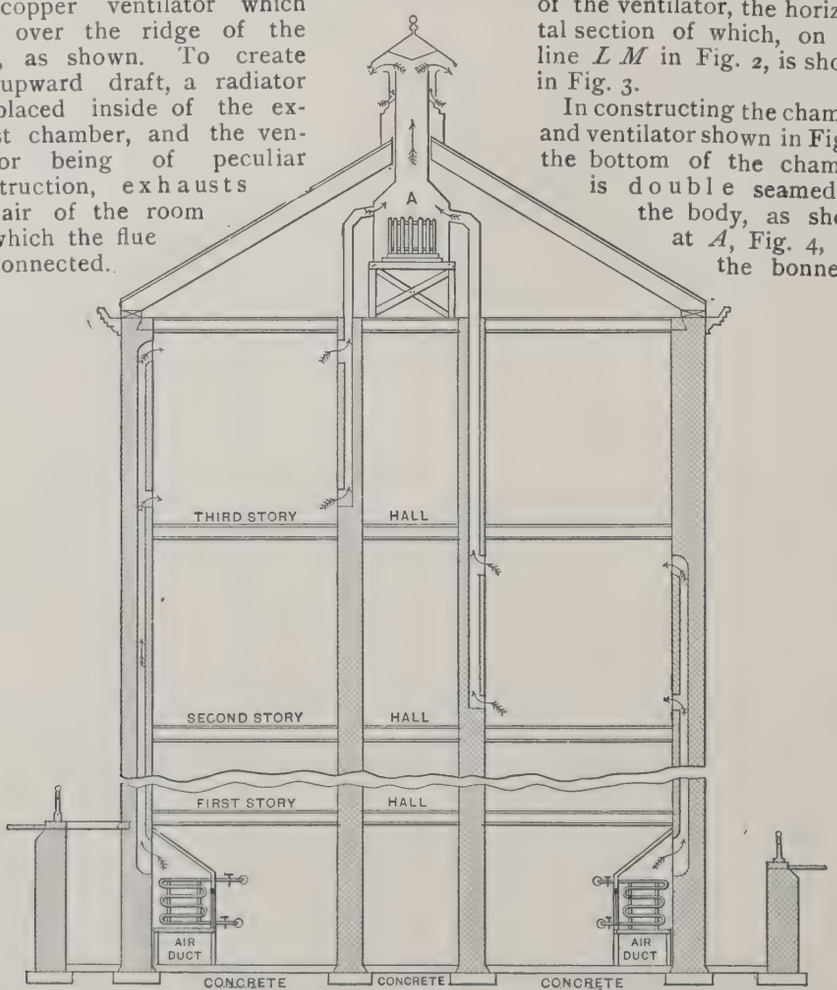
Practical Ventilation Work.—I.

BY VENT.

In this series of articles it shall be the aim of the writer to present in a practical and concise form the different systems of ventilation which have come under his notice during his service in the trade. The mechanical details will be fully and clearly described.

Referring to the diagrams, Fig. 1 is a sectional view showing the air ducts, steam coils, flues, exhaust chamber, and ventilator of the system of ventilation now in use in St. Vincent's Hospital, New York. All of the ventilation work in this building, including all necessary elbows, reducers, drums, air-tight doors, and ventilators, were made and put up under the writer's supervision. As will be seen in referring to Fig 1, currents of fresh air are forced into the air ducts, and become heated by passing over the radiators, entering the tin flues which are built into the brick walls, and flowing into the rooms through the registers placed near the floor and ceiling.

Referring to the middle partitions, which are also of brick in this case, tin flues are built into the walls, with registers at the floor and ceiling. These flues run up to the floor line of the attic, and from there are connected by means of galvanized iron pipes to the galvanized iron exhaust chamber shown at *A*. This exhaust chamber is in turn connected to the galvanized iron or copper ventilator which sets over the ridge of the roof, as shown. To create an upward draft, a radiator is placed inside of the exhaust chamber, and the ventilator being of peculiar construction, exhausts the air of the room to which the flue is connected.



PRACTICAL VENTILATION WORK.—FIG. 1.

This system of ventilation, briefly described, is that the flow of warm air into the room is regulated so as not to create a strong draft, the impure air being drawn out by means of suction of the warm air rising from the radiator in the exhaust chamber in the attic and the double action ventilator on the roof. Thus a constant flow of pure air passes through the room.

In this case every room has its separate flues, and no two rooms are connected to the same flue, thereby avoiding the danger of having the impure air of one room enter the other. By means of dampers in the registers the temperature of the room can be regulated according to the weather.

As to the mechanical features, Fig. 2 is an enlarged view, showing the construction of the exhaust chamber and ventilator. The diameter of the exhaust chamber is such as to make the area of the chamber the same as the combined area of the pipes which enter it, and the height is such as to allow a radiator to be conveniently set up in it. Let us assume that the chamber shown by *B'* in Fig. 2 has been so figured. When setting the chamber, it is placed upon a wooden platform, as shown by *X*, which is built to such a height that the top of the bonnet *C* shall come about six inches below the bottom of the rafter, so as to allow making an easy connection to the exhaust outlet inside of the ventilator, the horizontal section of which, on the line *L M* in Fig. 2, is shown in Fig. 3.

In constructing the chamber and ventilator shown in Fig. 2, the bottom of the chamber is double seamed to the body, as shown at *A*, Fig. 4, and the bonnet is double seamed to the body, as shown at *B*; then a flange is stretched on the top of the bonnet, over which the exhaust outlet is riveted as shown at *C*.



Fig. 3

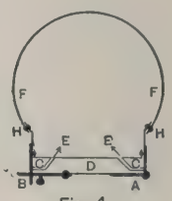


Fig. 4

PRACTICAL VENTILATION WORK.—FIGS. 2, 3, and 4.

The ventilator is usually finished complete in the shop, unless it is of a very large size, when it is usually finished in sections and fitted and marked in the shop, and then set together complete on the roof. Regarding the construction of the ventilator, *RR* in Fig. 2 represents the wooden frame on the roof, over which the ventilator is set and secured by means of bolts passing through the galvanized iron base and wooden frame, and fastened on the inside. *HFJ* represent the wrought iron braces which are bolted to the ventilator at *J*, and to the top hood at *H*, care being taken to provide enough braces to prevent the wind from taking off the top hood. *Y* represents a deflector (as shown by the dotted lines) which is placed on the inside of the hood, causing the air to flow outward according to the direction of the wind. As shown by the dotted lines, the outlet of the exhaust chamber almost reaches to the top of the body of the ventilator.

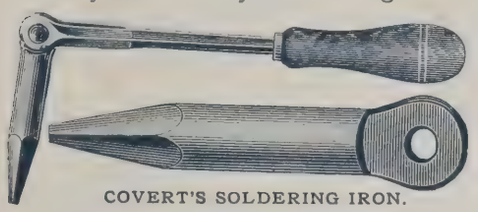
The body of the ventilator is made of such diameter as to have an air space of from two to three inches around the exhaust pipe. Small circular openings are cut around the entire body of the ventilator, as shown at *N*, following the direction of the arrows, creating a draft in the ventilator and thus assisting to carry off the impure air from the inside.

Fig. 4 is a section through the exhaust chamber on the line *D E* in Fig. 2, showing the construction of the air-tight door. *FF* represents the body of the exhaust chamber, *CC* the side frames which are riveted to the chamber at *H* and *H*, and *D* represents the door. It will be noticed that the joint between the door and frame is made so as to prevent any escape of air. The door is hinged as shown at *A*, with a clasp and socket for locking and unlocking, as shown at *B*. Hardly any air could escape through a joint as just described, but to make the joint absolutely air-tight, strips of sheet rubber of the required thickness are riveted to the frame and door as shown by *E* and *E*; then by locking the door tightly, an air-tight joint is obtained.

NEW SPECIALTIES.

COVERT'S SOLDERING IRON.

The copper point of the soldering iron shown by the accompanying cuts is pivoted to the handle, so that it may be adjusted to any desired angle. In

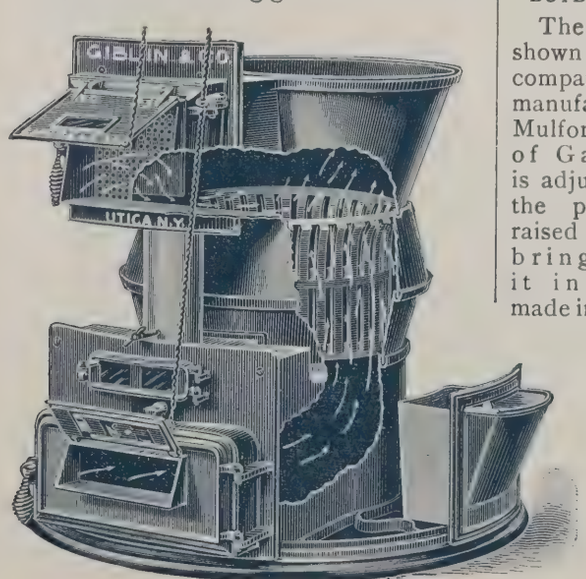


COVERT'S SOLDERING IRON.

changing the position of the copper point it is not necessary to loosen the screw bolt, as the adjustment of the handle and copper is such that a proper pressure on the copper will effect the desired change of position, it being immaterial how hot the copper may be. The inner surface of the forks are provided with concave or saucer shaped depressions surrounding the screw-bolt, thus gripping the copper at the outer edges only. The copper point is detachable, the worn-out copper being readily replaced with a new one. The Covert Mfg. Co., Troy, N. Y., are the manufacturers.

A NEW SMOKELESS FURNACE.

The cut presented herewith shows a smokeless furnace for burning soft coal recently brought out by Giblin & Co. of Utica, N. Y., the casing and radiators being removed and a portion of the side being broken away to show the position of the sectional fire pot and the course of the air currents entering through the combination door and ash pit, perfect combustion being secured by allowing the air to reach all parts of the fire. Air is admitted through a perforated plate in the upper or combination door, and is deflected downward by striking the solid plate back of it, becoming heated in its progress before it finally enters the combustion chamber. This air though warm is cooler than the air in the combustion chamber, which causes it to take a course along the bottom of the mouthpiece until it meets the ascending gases and is drawn



A NEW SMOKELESS FURNACE.

in and united with them. The parts of the soft-coal burning apparatus can be removed and replaced through the feed door without disturbing the other parts of the heater. There are no joints in the hot-air chamber through which gas and smoke may escape. The four-dome radiator, which rests directly upon the section of the heater shown in the engraving, is made in one casting without any joints, its peculiar construction giving practically a vertical interior surface, by which arrangement dust, soot, and ashes have no place to rest and must necessarily fall back into the fire pot, making the furnace practically self cleaning.

BANNER RADIATOR.

The radiator shown in the accompanying cut is made for either steam or hot water. The manufacturers state that the shape of the Banner loop is such as to give four-fifths exposed sur-



face and one-fifth inside surface, so that they are able to obtain more heat to the foot of surface than can generally be had from radiators with ordinary loops. This radiator is manufactured by the Muncie Architectural Iron Co., Muncie, Ind.

BOYD'S ADJUSTABLE PIPE HANGER.

The pipe hanger shown in the accompanying cut is manufactured by the Mulford Heater Co. of Galva, Ill. It is adjustable, so that the pipe may be raised or lowered to bring all parts of it in line. It is made in various sizes

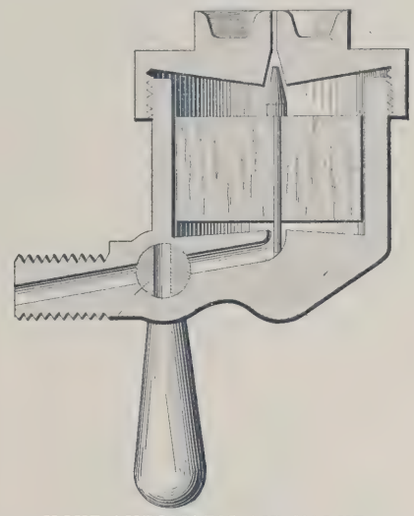


BOYD'S ADJUSTABLE PIPE HANGER.

and adjustable lengths, each size hanger being sufficiently strong to carry the pipe for which it is designed. It is a closed hanger, as shown, the stem being of malleable iron.

HOYT AUTOMATIC AIR VALVE.

The float of this valve is made of cork set on a small wire pin which projects a short distance above and below the cork, the lower end entering a socket in the bottom of the case. When the float rises, the upper end of the pin,

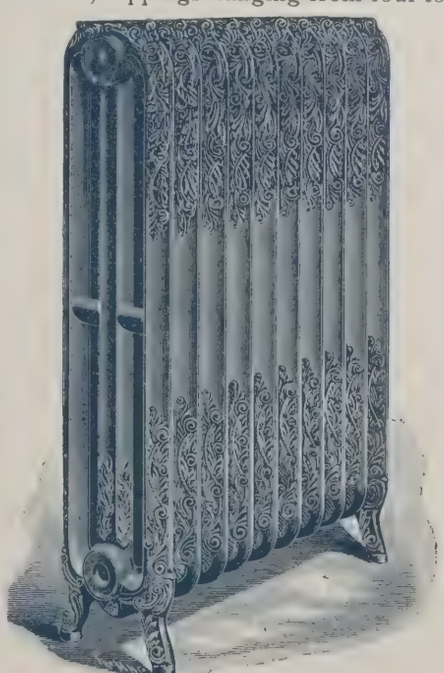


HOYT AUTOMATIC AIR VALVE.

which is ground to a taper point, forms a tight joint with the taper opening in the top of the cap. As shown, the valve is provided with a cock by closing which it may readily be cleaned. The Natural Gas Fitting & Supply Co., 292 Woodward avenue, Detroit, Mich., are the manufacturers.

NEW STANDARD RADIATOR.

The radiator illustrated herewith is designed for either steam or hot water heating and is made in various sizes with from three to thirty sections, each section measuring nine inches over all. It is made in five heights, $21\frac{1}{2}$, $25\frac{1}{2}$, $31\frac{1}{2}$, $37\frac{1}{2}$, and $43\frac{1}{2}$ inches. Ordinarily the distance from the center of opening to floor is $4\frac{1}{4}$ inches, but it can be furnished with special height leg sections, tappings ranging from four to

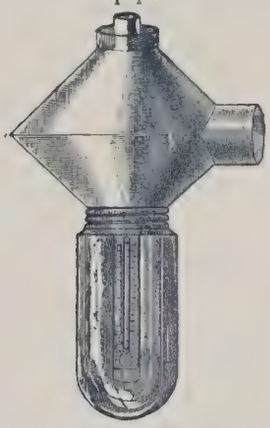


NEW STANDARD RADIATOR.

ten inches from center of opening to the floor. The Standard Radiator Co. Buffalo, N. Y., are the manufacturers.

SHORT-CONRAD TELETHERMOMETER.

This device, which is placed in the basement, is operated by the draft of the chimney, by means of which air is drawn any distance less than the height of the chimney in such a way as not to lose its temperature. This is accomplished by using a series of tubes, one inside the other, the outside one being $2\frac{5}{8}$ inches in diameter. Two currents of air are drawn down to the apparatus in the basement, one of the currents, the outer one, being for the purpose of insulation, and the inner one (which retains the temperature of its source) for indication. The insulating current passes off at the draft pipe, and the indicating current continues down over and around the thermometer to the bottom of the glass tube shown in the cut, thence passing back to the draft pipe and away with



SHORT-CONRAD TELETHERMOMETER.

the insulating current to the chimney. The instrument thus shows the temperature of any room with which it is connected. Paper material outside of the tubes protects them from sudden draft. The Short-Conrad Co., of Cleveand, O., are the manufacturers.

BRIEN PIPE CUTTER.

The purpose of this invention is to avoid the waste of soil pipe caused by the usual practice of cutting it by the use of cold chisel, hammer, and file. The use of this device insures a perfect cut, thereby effecting a great saving in pipe from having no split or broken pieces. In case a mistake in measuring is made, the pipe being too long, it can again be cut, even if it is necessary

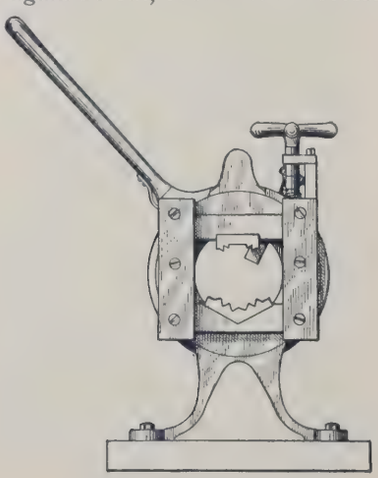


FIG. 1.

to cut off but a quarter of an inch. The cutter is light, and can be readily carried to the work and easily and quickly set up. It is provided with a double-acting vise on the back side (Fig. 2), through which the pipe is passed until the mark at which it is to be cut is directly under the cutting tool. The gear on the tool carriage,

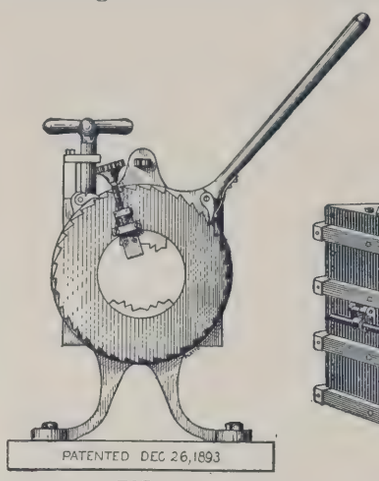


FIG. 2.

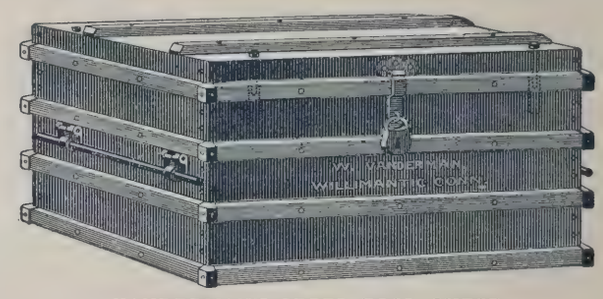
Fig. 1, is then turned until the cutting tool just touches the pipe, when, by grasping the lever and working the ratchet, the pipe is cut off, the cutting tool being driven inward at each revolution by teeth for that purpose on the frame of the device. T. R. Brien, Hoosick Falls, N. Y., is the inventor.

CURTIS & CURTIS PIPE CUTTER.

The construction of the pipe cutter shown by the accompanying cut is the same in general principles as that of other three-wheel cutters with the exception that it is provided with a simple and quick adjustment by which much time can be saved in fitting it to the size of pipe to be cut. As is clearly shown, the screw instead of running through the body of the cutter passes through a sleeve which slides in the body and is held by a spring pawl. The cutter is operated by sliding the sleeve until the wheel is against the pipe, when a few turns of the screw, while the cutter is revolved, cuts it off. The cutter has a range of from $\frac{1}{8}$ to 2-inch pipe, and is manufactured by Curtis & Curtis of Bridgeport, Conn.

VANDERMAN STEEL TOOL CHEST.

The cut presented herewith shows a tool chest just brought out by the Vanderman Plumbing and Heating Co. of Willimantic, Conn. It is made of steel, and is designed to take the place of the ordinary tool chest used by

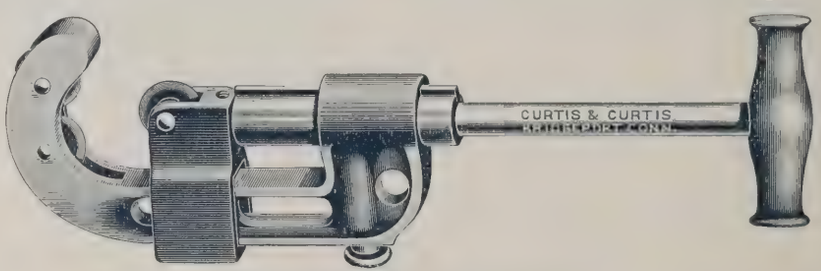


VANDERMAN'S STEEL TOOL CHEST.

steam fitters, plumbers, and others. It is provided with malleable iron corner pieces and hardwood braces, and is fitted with bolts to secure the cover, being furnished complete with hangers, lock and key, and wood drawer. It is not easily broken or bent, and is made in three sizes, weighing respectively 40, 60, and 75 pounds.

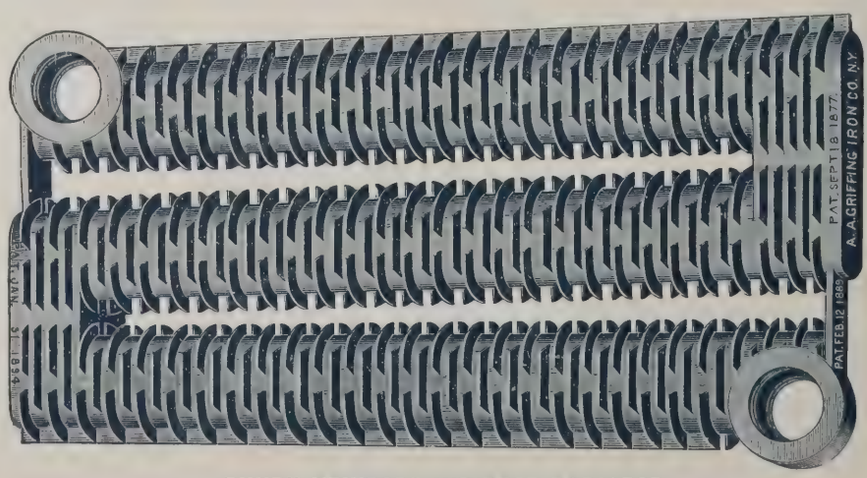
BUNDY NEWPORT RADIATOR.

The indirect radiator shown by the accompanying cut is adapted for either steam or hot water heating. It is



CURTIS & CURTIS PIPE CUTTER.

made by the A. A. Griffing Iron Co., Jersey City, N. J., and is of the extended surface type of radiation, as shown. The sections have three arms each, and are 37 inches long, $3\frac{1}{2}$ inches wide, and 15 inches deep. When made up into stacks the sections are connected



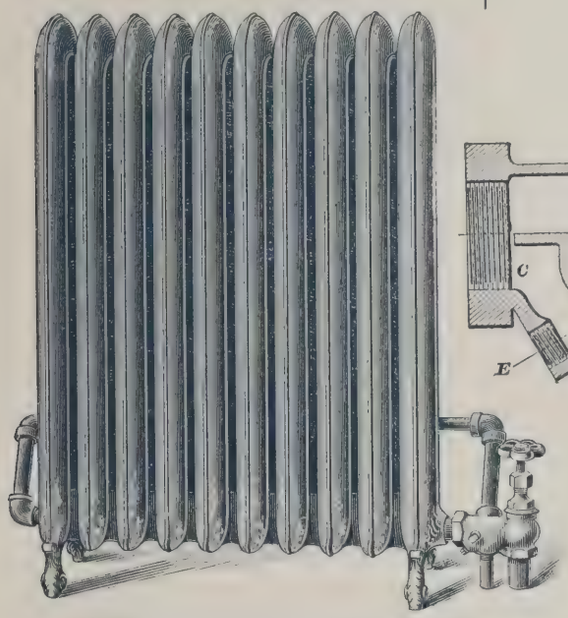
BUNDY NEWPORT INDIRECT RADIATOR.

by heavy 2-inch right and left hand hexagon nipples. The lower nipple connection is depressed so that all the water of condensation drains from the

sections, the whole construction being such that positive circulation is insured.

HUTCHINSON COMPOUND RADIATOR VALVE.

The valve here illustrated is designed to do away with the use of air valves, to avoid the annoyances and danger of flooded floors, and to secure a more positive and complete circulation of steam. This is accomplished by supplying steam to both ends of the radiator at the same time. As shown in Fig. 3, the passage *A*, through which the steam passes directly to the radiator, is divided horizontally into two parts, steam being supplied to the other end of the radiator, as shown in Fig. 1, through a pipe attached to a second outlet *B*, Fig. 3. This pipe may pass behind the radiator, or between the loops in the case of a two-row radiator, or may be used as a comfortable foot rest in front of the radiator. The check valve *D* prevents any reversal of circulation, and is so attached that it may readily be removed, ground to its seat, or a new one substituted as required. By removing the plug at *E* it may readily be inspected. The water of condensation takes care of itself, freely discharging by gravity through the check valve *D*, so that danger of freezing is avoided. This valve can be readily attached to any style of radiator without changing holes in ceilings or floors. James H. Hutchinson, 117 W. 115th St., New York, is the inventor and manufacturer.



HUTCHINSON RADIATOR VALVE.—FIG. 1.

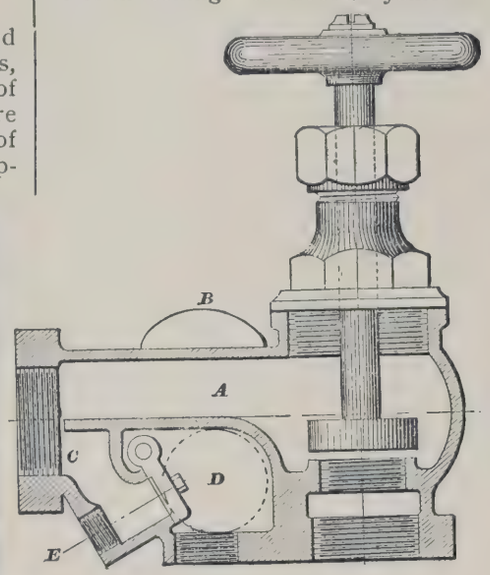


FIG. 3.

HITCHINGS WATER HEATER.

This heater is designed expressly for heating small conservatories and plant cabinets such as are frequently found in suburban residences. It is easily managed and with as little care as an ordinary base burning stove, and can be left without attention for nine or ten hours during severe cold nights. The accompanying sectional cut shows the water spaces around the fire chamber and ash pit, the magazine or feeder for coal, the shaking grate, doors, etc. Hitchings & Co., 233 Mercer street, New York, are the manufacturers.

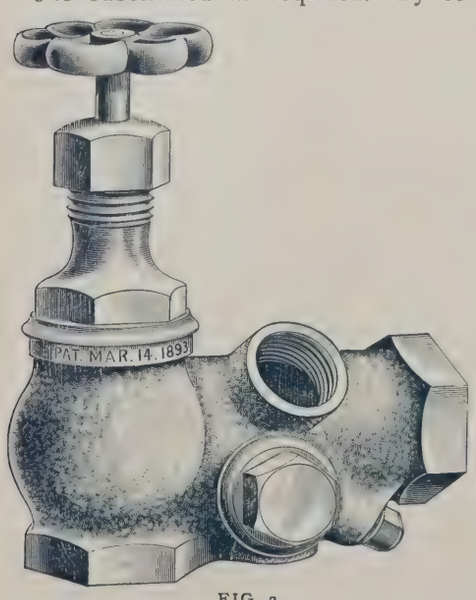
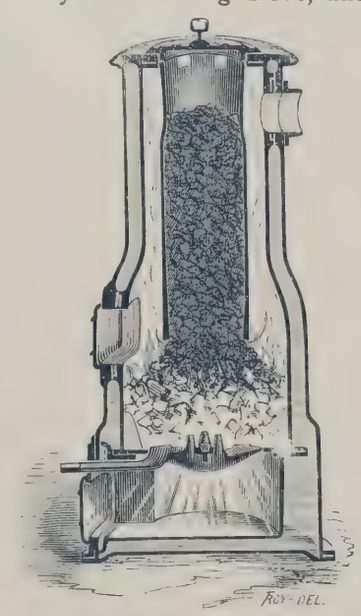


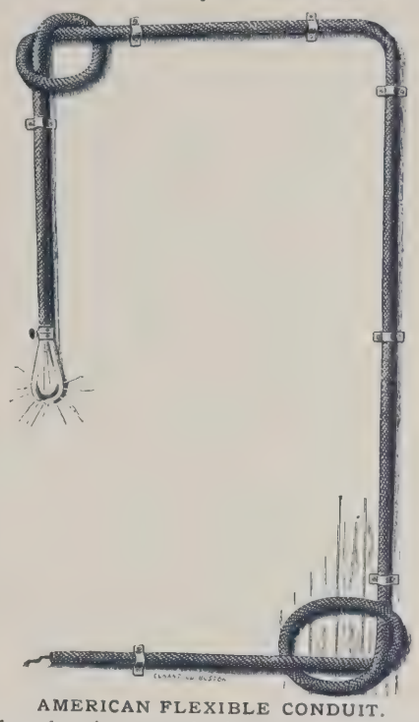
FIG. 2.



HITCHING'S WATER HEATER.

AMERICAN CIRCULAR LOOM FLEXIBLE CONDUIT.

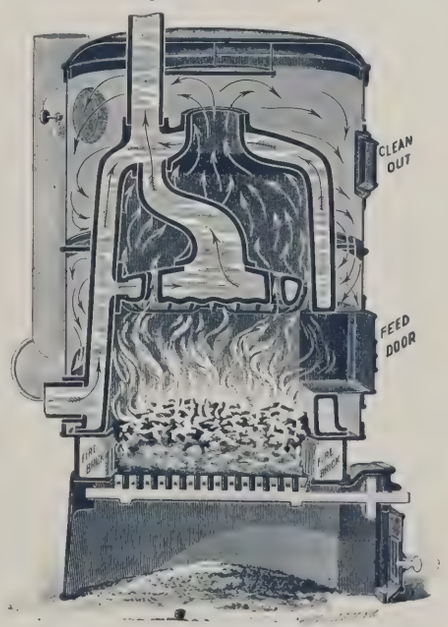
The accompanying cut shows the flexible conduit for interior electrical wiring of all kinds manufactured by the American Circular Loom Co. of Boston, Mass. It consists of a spiral of insulating fiber wound with a heavy Para rubber friction tape over which is a continuous woven jacket of cotton similar to that used on the ordinary cotton garden hose except that the stitch is much finer, giving it the quality of strong canvas. The whole tube is saturated with an insulating compound, care being taken that none shall touch the inside fiber, thus leaving the inside of the tube smooth and hard. It is finally run through powdered mica, producing a tube that is not only flexible but water and fire proof as well.



AMERICAN FLEXIBLE CONDUIT.

SCOLLAY'S IMPROVED BOILER.

This heater is practically the same as that described last month in our special article on steam and hot water boilers, the difference being that this one is provided with an outer non-conducting casing in which a casing ring is so placed as to form a baffle plate and cause an indirect draft. The smoke outlet at the back connects with the boiler at top and bottom, the draft being direct or indirect according to the position of the damper at the top. The boiler is made in four sizes by John A. Scollay, 74–76 Myrtle avenue, Brooklyn, N. Y.



SCOLLAY'S IMPROVED BOILER.

Heating and Ventilation

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AN OUNCE of prevention is worth a pound of cure. Looking at the subject from the position of one who is constantly in touch with the heating trade throughout the United States, it is impossible for this journal to understand why it is that any master steam or hot water fitter should for a moment hesitate to give the National Association his financial and moral support. Would he make any money if the consumer could buy as cheaply as himself? Hardly. This is exactly the situation affairs would be in to-day were it not for the restraining influence of organization. In 1888, when the Chicago local was formed, affairs in the West were in such a shape that if any fitter was to have long life, it was necessary that his large and continuous purchases of supplies should be recognized as more valuable to the manufacturer than an occasional or one-time order from a consumer, in order to be able to buy so that in taking a contract a living profit could be made. Boston was in practically worse shape, and Portland, Me., and Philadelphia are so to-day. The result of organization has made Boston and Chicago profitable fields for the contracting fitter, and in every part of the country the work of organization has helped to harden prices, resulting in benefit to all. It is, however, the harmonious co-operation of every fitter, no matter how small his trade, that will surely bring success; and the larger contractors can well afford to be magnanimous, in order that this condition of affairs may be brought about. No one should fail to support the movement simply because its first cost may seem large to him. He will more than make it up in the satisfactory prices that will naturally follow. It is now practically assured that the master fitters of St. Louis, Mo., will come to New York in a body. Chicago and Boston will also send their quota, and we urge every one interested, whether a member of the association or not, to attend the convention. The interchange of ideas alone will be more than worth the expense; and we sincerely trust that "action" will be the watchword, that the air of lukewarmness which some of our friends have allowed themselves to get into may be a thing of the past, and that they will give the association their enthusiastic support and make it the grand success it ought to be.

MASTER steam fitters will, by June 1st, receive the following letter from the executive committee of the Master Steam Fitters' Association:

The sixth annual convention of the Master Steam and Hot Water Fitters' Association of the United States will be held at the Broadway Central Hotel, New York city, commencing Tuesday, June 19, 1894, at ten o'clock A. M. A cordial invitation is extended to all master fitters to attend this meeting, whether members or not. We urge each and every one who receives this communication to make inquiry of others of the craft, and to advise any whom it has failed to reach that they are included in the invitation.

Reading of the papers by members has been an attractive and successful feature of our last two conventions. By referring to the various trade journals you will see our announcement giving subjects and authors of articles promised for this annual meeting. New York city, with its diversified interests, is attractive at any season of the year. On the 15th of June the numerous summer resorts in and about the city will be open to the public, and can, after final adjournment, be visited by those who desire to do so. The Broadway Central Hotel is located on Broadway, between Bleecker and Third streets, and is in its appointments well adapted for holding conventions. The accommodations are first class and ample. For rates see return postal card, which please fill out and mail. Railroads have granted full rates going and one-third returning by same route. Secure your certificates when buying your tickets and have them properly indorsed at the meeting. Local ticket agents will be instructed, and can give full information. The usual entertainment will be arranged for the ladies, and we hope they will be here in increased numbers to enjoy it. Those desiring to make exhibits of their goods at the convention can get particulars by addressing the proprietors of the Broadway Central Hotel. Many have already secured space, which emphasizes the importance of the meeting.

ELECTRIC heating and cooking are just now demanding considerable attention, the advocates of the use of electricity recommending it on the score of economy, cleanliness, and ease of handling. The article by A. M. Pere on the subject of electric heating which we publish this month is at variance with the generally accepted idea that for heating purposes electricity is economical, it being shown that when we can heat by electricity at the same price as by steam the electric light will cost the same as gas light with gas at one cent a thousand, the present cost of gas being $2 per thousand

COMMENTING on the future of electric heating, further facts on which will be presented next month, our esteemed contemporary The Electrical Engineer, a recognized authority in the electrical field, recently said, "There are late days in spring and early days in autumn, when furnaces have been extinguished but when untimely cold makes everybody shiver. At such moments, the warmth of an electric heater, to be had in a moment, would be a perfect godsend. This is particularly the case in Northern hotels where at all seasons of the year there are guests from Southern climes who want their rooms warmed, but for whom it is very inconvenient to make fires or start the whole heating system. Almost every hotel now has its electric plant in operation the year around, and should afford, therefore, a market for electric heaters to render such a service. The only point of caution and warning is to teach people to be reasonable in the use of current and to insist on the best wiring. With these and one or two other little points looked after, the local company that now engages in electric heating and cooking will soon reap a rich reward."

LETTERS FROM PRACTICAL MEN.

Correspondence from practical men upon topics of interest relating to Heating, Ventilating, and kindred subjects, will find a place in this department. The editors, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

Size of a Boiler.

A problem has come up in my practice which has occasioned some discussion, and I would like the opinion of your readers as to the correct solution.

There is a tank holding 500 gallons of water, which is to be maintained at 200 degrees F., and is covered, but still at atmospheric pressure, every hour 50 gallons of water are drawn off and its place supplied with water at 60 degrees F. How large a boiler must I have to do this work, that is, maintain this temperature of 200 degrees, and guarantee results, and what is the method of determining such sizes?

INQUIRER.

Furnace Temperatures.

In discussing the construction of certain low pressure boilers of the sectional type, the point was recently raised by one representative that it was wrong in principle to introduce the return water into the hottest part of the boiler. The question at once arose, "Where is the hottest part of the boiler? Is it within the bed of burning coals, or in the gases in combustion outside the bed of coals?" An equal division of the disputants here took place. To settle the matter, it was referred to a group of four practical engineers, acquainted with the actual workings of the principal types of high pressure boilers. The division on the question was again equal, and their different experiences ranged from four or five to twenty years. Here was an interesting question to be settled. Two firms of consulting engineers were now called upon, and the members composing each again equally divided. Later, the now much discussed question was propounded to a firm of heating engineers, and they (father and son) at once took opposite views. Without now rehearsing the various arguments, pro and con, cannot some of your readers cite page and passage in some authority of repute which absolutely and definitively shows just where the highest temperature does exist in the furnace of a boiler?

H. TEMP.

Comparative Efficiency of Hot Air and Hot Water Heating.

Referring to a recent remark of Mr. Blackmore, which I note in his second paper on the method of warming buildings, he makes the following statement: "Observations go to prove that direct hot water is forty per cent cheaper than hot air in performing the same work." The writer would like to inquire if Mr. Blackmore in making this statement has allowed for the extra work which is performed by the furnace in warming the building in which it is placed, which we assume is what he means by his expression, "Performing the same work." He is, of course, bearing in mind that in a furnace the air is taken at the outside temperature, warmed, and passed into the room; whereas the direct hot water is warming the same air, or rather is simply supplying to the air what heat is lost through radiation from the walls and windows.

It is the theory of all heat engines that their efficiency is proportional to the differences in temperature between which they work. If we can consider a warming apparatus as a heat engine, why is not this difference in favor of the furnace?

The writer, of course, understands that it is more expensive to warm a house by taking outside air and raising it to a temperature requisite to do a given work, than it is to merely supply to the house the heat it has lost in radiation. Of a certainty, the direct hot water is cheaper, but at the same time, is not some of the forty per cent which Mr. Blackmore indicates in its favor partially due to its being a cheaper job and doing cheaper work?

HOT AIR.

Smoke Temperature.

In the March issue of HEATING AND VENTILATION are two very interesting and instructive editorials upon the above subject, but the implication conveyed to the average reader is that a house-heating boiler which makes the claim of wasting only the cool smoke should be eyed with grim suspicion.

As this is quite the reverse of the methods of the courts of justice, where the "accused is considered innocent until he is proven guilty," I would take up the cudgels for some that I know to be thus condemned. To be specific, I now have a house-heating boiler in mind, in which the construction is such that, under ordinary conditions, the hand may be held upon the smoke pipe without discomfort, a foot or two away from the boiler. This is accomplished by means of heating surfaces rendered effective only in that they are made to act as an economizer of heat (otherwise wasted) by presenting the cool return water contained within them directly in the path of the escaping gases, thus abstracting heat which would otherwise only have raised the smoke temperature.

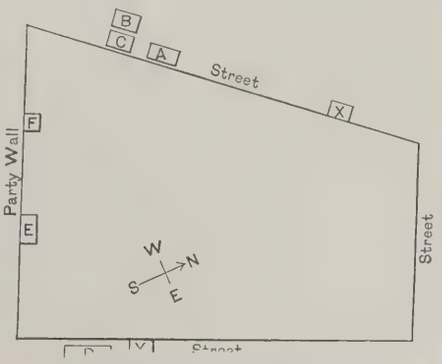
With one of these boilers, Prof. L. R. Taft, of the Michigan Agricultural College, obtained a temperature of the air in the smoke pipe on leaving the boiler about the same as the water in the flow-pipes, which, in his (hot-water) apparatus, was about 190 degrees.

This particular example has been brought up in order to provoke discussion, if possible, and to learn from some of the knowing ones just what are "efficient" and what are "wasteful" smoke temperatures under working conditions with house heating boilers. Let us have some definite data and tables.

PHŒNIX.

A Ventilating Problem.

Here is a ventilating problem which I should like to have some of your expert



A VENTILATING PROBLEM.

readers or advertisers solve if they do not consider it too much trouble to do so. We have a large office building shaped as shown in the accompanying cut, in which *A* and *D* represent two large boilers in a vault under the street, *B* and *C* being two smaller boilers; *E* is the boiler flue, *F* is a small ventilating flue opening into the cellar, and *X* and *Y* are street elevators, which can remain open. The cellar is clear except for the piers, and the steam pipes and flues are bracketed to the ceiling. The sub-cellar contains dynamos, pumps, and machinery. Against the party wall in the southern end the temperature of the cellar and sub-cellar will run up to 118 degrees in summer, and the ventilation is bad. What can we do?

CONTRACT OPEN.

Oil as a Fuel.

In order to properly answer an inquiry recently made of the writer as to whether or not oil could be burned in a house heating boiler, the following interesting facts were arrived at, together with much valuable data and certain valuable tables which may later appear in these columns.

In the first place, as is well-known to most of your readers, it is perfectly practicable to burn oil or gas under boilers in place of coal, coke, or wood, but the point in ninety-nine cases out of a hundred with the consumer is: "What will it cost?" It must primarily be determined what it does or will cost the consumer to burn coal, coke, or wood under his particular boiler. Assuming (as was the case) that the coal cost $5 delivered in the boiler room and assuming this to be anthracite it is found that the consumer would evaporate, say, eight pounds of water per pound of coal, burned with ordinary draft and with feed water at an assumed temperature of 62 degrees F. On this basis the cost for evaporating, say, one million pounds of water would be $279.02.

Next, as to oil: Assuming (as was the case) that oil could be purchased at "two and one-half cents in tank-cars on siding,' and that one half-cent additional per gallon was needed to land it in the boiler room; and assuming that with this oil an evaporation could be got of, say, sixteen pounds of water per pound of oil (6½ pounds to the gallon) burned under ordinary conditions, with feed water at an assumed temperature of 62 degrees F., the cost of evaporating one million pounds of water would be on the above basis $218.45. It will be seen at once that the oil actually costs more by about three per cent, but to handle his coal and ashes will cost the consumer about fifty cents per ton, or in other words ten per cent of the price of his fuel, which would leave the odds in favor of oil by about seven per cent. Of course as the price of coal falls below $5 per ton and the price of fuel oil per gallon rises above three cents, the relative costs will vary, hence each case must be figured out separately.

Only a word further as to the assumptions above. Those in regard to the coal may be dismissed by saying that they are daily obtained. Those in regard to the oil have been and may be obtained. Higher and lower evaporations are claimed by experts of acknowledged repute and abilities, and generally oil does cost more than is given above. The matter of a proper oil burner cannot now be discussed, but it is a very vital point in the problem to be solved by the consumer.

O. I. L.

Size and Rating of Boilers.

I note in your March issue what A. C. E. says in continuation of the matter which is practically a consideration of the relative efficiency of a steam or water apparatus. What is therein said shows that A. C. E. is basing his statements upon the relative efficiency of a foot of fire surface in a boiler working under conditions which would, in the main, be met with in a steam or water circulation. I have previously stated that I do not consider square feet of fire surface a proper basis for comparison of the two systems. Our correspondent is basing his ideas in relation to fire surface upon facts, which, while they are true enough and unquestionably correct, yet do not offer a correct solution of the problem, inasmuch as they are not carried out thoroughly to meet the conditions as occurring in actual practice.

As I understand our correspondent he would express himself in this vein. Inasmuch as a foot of fire surface in a water circulation is generally at a lower temperature than a foot of fire surface in a steam boiler, the water circulation is more efficient; therefore it will require a less number of feet to do the work and consequently a smaller boiler. This, as I understand it, is the question which he propounds in the problem which he mentions. Without going into the details of the problem, I grant at once that under the conditions which he mentions, the foot of fire surface at 170 degrees can be accredited with some ten or twelve per cent more work than can be credited to a foot of steam surface working under the same temperature of combustion. So far we are evidently agreed; but let us consider the matter a little further, and more in accordance with the conditions of a correct and actual practice.

In the first place, we must understand that

a warming apparatus is, in the nature of the case, of peculiar limitations. It is proportioned to meet the requirements of but one day in the year, and that is the coldest day which occurs. It is evident from this that a satisfactory apparatus must be more or less flexible, since it must warm the house in question without overheating it in mild weather, and yet keep an even temperature when the thermometer is below zero. All this flexibility is claimed and obtained from a water circulation.

How many water systems are there which are proportioned for the purpose of maintaining a room at 70 degrees with the outside air at from 10 to 12 degrees below zero with a radiating surface at 170 degrees? Very few, I am certain, and if such a calculation were made, it would be erroneous in several points. First, to do that amount of work with a radiating temperature at such a proportionately low figure, we must have so large a radiator that it is a disagreeable object to look at. Second, by having so large a radiator, the owner has been obliged to pay for much which he would have gladly dispensed with, and which could have been omitted to his advantage, so far as appearance and first costs are concerned. Third, if a fitter figures on so much radiation, he runs a chance of losing the contract in competition; and fourth, with so much radiation running at as low a temperature as is possible in mild weather, there is great danger of overheating. How are we to avoid this? Simply by reducing the amount of radiation and proportioning the apparatus so as to get any extra heat needed by raising the temperature of circulation. In other words: instead of carrying the reserve power in the form of radiators, carry it in the form of ability to secure requisite temperatures. Now then, if at any time one wishes to raise the temperature at which it is desirable to circulate the water, all the theoretical efficiency of the low temperature fire surface disappears, and so far as the question is concerned, one is dealing with a steam apparatus; therefore, in either case, a boiler of the same size is required.

We are accustomed to hear a great deal of the uniform efficiency of a water circulation. This is hardly correct, and is true only when we consider the working of such an apparatus in mild weather when it can be run under conditions highly favorable to its efficiency. Beyond any doubt, the theory of the question can be stated so as to sound wholly in favor of the water system, and the song has been sung so ceaselessly to that music, that we sometimes thoughtlessly deceive ourselves. The writer thinks that in actual practice it will be found that in a close comparison of water and steam circulations, whatever extra efficiency could be secured to the credit of the water would occur only in mild weather, and that when either system is being worked to its full capacity, there is but little variation in favor of either one.

KNIGHT.

Central Station Heating.

I am duly thankful for the "enlightenment" I received in the March number of HEATING AND VENTILATION, through one of its columns dedicated to discussions by practical men; but there are flashes of light so vivid that they do for a time paralyze the sight. Such at first seemed to be the case when I read the comments of Mr. Babcock in his attempted demonstration of the impossibility of economically transmitting heat by the medium of water through extended mains. But as this light, emanating from the Holly system of heating, and partially reflected by Mr. Babcock, dies away, there are a few things that become very apparent, and worthy of most practical consideration.

In the first place, we must bear in mind that the main physical law governing gases and liquids is the same—both transmit pressure equally in all directions. If we pump water into a tank at the top of a building, say a hundred feet high, we are of course exerting a power capable of lifting the weight of the water in transit; but if from this tank we make a pipe connection with the suction end of the pump, then we have an equal pressure on both sides of the water piston, due to the head, which is manifestly the same on the suction side as on the side of the discharge. Therefore the work of a circulating pump is only such as is required to overcome the friction between the column of water and the inner surface of the pipes. It will be readily seen that the weight of the circulating medium is not the factor which Mr. Babcock's statements would imply. But back pressure on an engine is a great factor relative to economic operation, as is also the increasing of initial pressure at the boilers. Due thus to the hydraulic law that we have an equal pressure with an equal head, and that therefore no lifting of the weight of water is required by the circulating pump, and also owing to the great capability of water to absorb and hold heat with so small a loss during transmission, it would be fair to claim economy as surely to result from the use of the water medium for the transportation of heat as employed by the Evans system.

I still feel confident in making the assertion that steam cannot be supplied from a central station and compete with the modern heating apparatus, such as is found in most of the New York office buildings. Even live steam generated only for heating purposes has proven no competitor. Where then does the comparatively sluggish exhaust get a claim,—with its detrimental effect, due to back pressure,—unless there is adopted the system of water transportation? By such means the heat in the exhaust steam is immediately stored in the water, and after the water gives up this heat to the coils located in individual apartments or heating chambers, it is returned by the action of the circulating pump to be reheated. THEO. C. IVES.

Decker System of Ventilation.

In reference to my system of ventilation, which you said you would describe in this issue, I wish to state that in this part of the country (Kingston, N. Y.), brick and stone edifices can be constructed with hollow exterior walls without additional cost, the builders in estimating making no distinction between solid and hollow walls.

The exit of foul and cold air from a building is greatly facilitated by way of an airspace in the exterior walls, because of directness and gravity, together with exhaustion.

James R. Willett, in an article on the heating and ventilation of residences, in the December issue of this journal, says (page 5), "If you heat the exposed sides of a room you will heat the whole of it." In the same number, Walter B. Snow, in his article on factory and school house heating, says (page 6), "In the given time all of this air must escape at the temperature of the room, which is here 70 degrees; hence the loss by this means will also be 70 units, and it can by no means be reduced except by deliberately reducing the volume of air admitted or by decreasing the difference between internal and external temperatures. It is evident that with a fan running at constant speed, and delivering a stated volume of air, the ventilation may be reduced by returning a portion of the air from the building; and the expenditure likewise lessened. The loss by radiation and conduction, on the other hand, can be reduced by sufficient, although perhaps extravagant, expenditure for double or triple sash, thicker walls, plaster, back plaster, sheathing paper, and the like."

The Decker system of ventilation solves the above difficulty without additional cost. It increases the temperature on the exposed sides of a room, spoken of by Mr. Willett, and it demonstrates a new way (not known to Mr. Snow) of lessening the loss of heat in the ventilation of buildings without reducing the volume of air admitted and without returning a portion of air from the building; and it is accomplished, as Mr. Snow affirms, "by decreasing the difference between the internal and external temperatures," with the out-going air, which "must escape at the temperature of the rooms" into the general air-space in the outer walls, and so increase the temperature in the walls on its way to the ventilating shafts. That reduces the loss of interior heat by radiation and conduction in a similar way to that described by Mr. Snow; i.e., we have the double walls, the air space between the walls, and the heating of the air space with the out-going heat before it is lost to the building, which lessens the difference between the internal and external temperatures; and also lessens the loss of heat by radiation and conduction, without additional cost of construction.

That the temperature of a house will vary as the outside atmosphere, other conditions being constant, is a well-known principle. If an artificial atmosphere is produced about a house such as is accomplished by the Decker system of ventilation, is not a normal temperature maintained in the rooms at a much less expenditure of fuel? Or, other things being equal, would not the same amount of fuel that would make another house comfortable, overheat my house? It certainly would. W. M. DECKER.

Temperature Regulation.

In your April number, speaking editorially of temperature regulation by means of thermostats, you mention the disadvantage arising from the fact that the mixing dampers are either wide open or tightly closed, resulting in alternating currents of hot and cold air into the rooms, and say that "what is wanted is a thermostat which shall be progressive and not intermittent in its action."

The writer recently visited the First Ward School of Long Island City, and through the courtesy of Mr. R. Eadie, the principal, was enabled to inspect the heating system of that fine new building, which is controlled by twenty-seven thermostats, each operating a swinging mixing damper. A careful reading of the thermometers in the class rooms showed a difference of but 3 degrees, the average temperature being 71 degrees, the highest mark reached by any thermometer being 73 degrees and the lowest 70 degrees. I was informed that in the main assembly room the temperature at school opening time was often 95 degrees previous to the introduction of the thermostats, and it now remains at 70 degrees, with full current of air entering the room at all times.

In the basement of the building are four fans blowing the air over exhaust steam coils into the tempering chamber, in which the heating coils are located. In the flues running to the various rooms there are mixing dampers which, *gradually* operated by the thermostats, determine just how much of the air shall be forced direct from the chamber and how much shall pass through the reheating coils. As the plant was operated when first started, these dampers were adjusted by the engineer as reports came from the different class rooms relative to the temperature, keeping him "everlastingly at it," which by no means "brought success." With the present system a rise of one degree in the temperature causes the damper to move and proportionately closes the hot-air inlet and open the inlet to the cooler air a corresponding amount. It is interesting to watch the action of the dampers and see them assume a position just due to existing temperature in the rooms where the thermostats are located. The system is almost human in its operation, and a marvel of simplicity, having no small parts, and what is most important, no electrical batteries, being purely mechanical.

In addition to the instruments mentioned, a thermometer is located in the tempering chamber, with its dial on the gauge board in the engine room some one hundred feet away, giving the engineer the temperature of air in the tempering chamber and avoiding the necessity of frequent trips that would be required to inspect an ordinary thermometer.

A regulator also throttles the steam entering the hot water tank, keeping the water at a positive temperature, and illustrating the fact that the use of the thermostat is not limited to controlling dampers in hot air flues alone, but can be used to control the supply of steam to coils in direct radiation systems.

The want of "a thermostat that is progressive and not intermittent in its action" thus appears to have already been filled. P. M. C.

NEWS AND NOTES.

Large Buildings.

Niagara Falls, N. Y.—The Cataract Construction Co. have decided to let the contract for their three-story stone office building to Stewart & Co. of Buffalo and St. Louis, Mo.

Delhi, N. Y.—Notice is given that plans and specifications for the annex to the court house at Delhi, N. Y., are now on view in the office of county treasurer at Delhi, and at the office of Lacey & Bartoo, Binghamton, N. Y., from the 10th to 21st May, and that all bids must be in on or before said 21 May.

Rochester, N. Y.—C. B. Woodworth will build a six-story business block on Lower State street near the corner of Platt street, to cost $60,000, to be fire-proof, and have pressed-brick front. The trimmings will be terra cotta and sandstone. The front of the building will be made with two stores, and Harding & Todd, shoe manufacturers, will occupy the balance of the building.

Milwaukee, Wis.—Chas. F. Ringer of 27-107 Wisconsin street is architect for the $25,000 business building to be built for Enno, Doreston & Son of 232 West Water street.

Minneapolis, Minn.—Sealed proposals will be received to June 5th for heating and ventilating the county part of the Court House and City Hall building, as per plans of archicects Long & Kees, No. 603 Kasota Building, Minneapolis, Minn.

Cincinnati, O.—Plans have been made by H. W. McLaughlin for the erection of a five-story office building for J. W. Mulhauser to cost $40,000.

Brooklyn, N. Y.—Ernest W. Ford of 872 Carroll street, will build five brick dwellings on Carroll street, near Ninth avenue, $60,000.

Chippewa Falls, Wis.—Chippewa County will build an $80,000 insane asylum.

Superior, Wis.—Captain S. C. Barker has plans for a $50,000 apartment house.

New York, N. Y.—Sealed proposals will be received until noon 17th May at the office of the Comptroller, Stewart building, for furnishing and alterations for the new Criminal Court building, to include furniture, metallic fixtures, alterations in steam fitting and heating and ventilating and bids for joinerwork, mason work, iron work, plumbing, gas-fitting, electric light, painting, and general work.

Brooklyn, N. Y.—It is stated that the Crescent Athletic Club have agreed with Jos. Wechsler that he will build them a handsome club house to cost $200,000 on the site of 25 Clinton street, Brooklyn, and that they will take a ten-year lease.

Pittsburgh, Pa.—The Board of Colportage of the Presbyterian Church will erect a $500,000 Presbyterian house in Pittsburgh, Pa. W. O. Campbell of Sewickley is president, and will give details.

Hartford, Conn.—The Open Hearth Association, of which B. N. B. Miller is superintendent, have decided to erect a handsome building to cost $50,000, to be used as home reading room, etc., for the unemployed.

Cleveland, O.—C. F. Schweinfurth of 37 Blackstone building is architect for the proposed new building for the Cleveland Telephone Company, to be six stories high, and to cost $100,000. No contracts let.

Medina, O.—The County Commissioners have decided to build a $30,000 infirmary.

Clarksburg, W. Va.—Plans have been made by Yost & Packard of Columbus, O., for a hotel and opera house for Clarksburg. Thomas Moore Jackson is president of the company which will erect the building.

Bedford, N. Y.—John Moore of Syracuse has been awarded the contract to erect the New York State Reformatory for Women at Bedford. Contract price, $168,000.

Syracuse, N. Y.—J. D. Hamburger will build a five-story brick and stone trimmed mercantile building on James street, Syracuse, N. Y., from plans of Architect C. D. Wilsey, to be 33 by 70 feet. Mrs. J. S. Kenyon will build a four-story apartment house on Warren street, Syracuse, N. Y.

Cincinnati, O.—M. Rothschild of Fifth and Race streets will build a $35,000 store from plant of Jes Jardins & Hayward, to be of brick with stone trimming and artificial iron work.

Detroit, Mich.—Thos. H. Fordyce of 27 Opera House block will erect a $30,000 apartment house, from plans of A. C. Varney, 48 Campau building. Address Mr. Fordyce at 27 Detroit Opera House block.

New York, N. Y.—The plans of Ernest Flagg of 54 Broad street, New York, have been accepted for the $1,000,000 capitol at Olympia in the State of Washington.

New York, N. Y.—Sealed proposals will be received to July 1st by M. Alexander, president of the Deborah Ladies' Nursery, at 95 East Broadway, for the erection of a building on Eagle avenue, 161st and 162nd streets, as per plans to be seen by appointment at the office of Max Mueller, 21 Centre street, New York.

Albion, N. Y.—Contractor Arthur Nixon will build fifty dwellings at Depew this summer to cost $25,000 each Address him at Albion.

Brinton, Pa.—The Westinghouse Electric Co. of Pittsburgh, Pa., and New York is preparing to erect 150 dwellings for their employees at Brinton.

Buffalo, N. Y.—The Church Charity Foundation Association has taken out building permit for a three-story stone and brick building to be erected on Front street, near Rhode Island, to cost $32,136.

Philadelphia, Pa.—Wendell & Smith of Overbrook have taken out permit for seventeen three-story brick dwellings to be built on City avenue.

Northampton, Mass.—Ex-Governor Knight, Judge Strickland, and John C. Hammond, the building committee for Clark Institution, have adopted the preliminary drawings made by Architects Putnam and Bailey for their proposed new building, and they will furnish specifications and call for bids as soon as possible.

Philadelphia, Pa.—Doyle & Doak have been awarded the contract for the proposed new building for the Real Estate Title Insurance and Trust Co. on Chestnut street, opposite Independence Hall.

Detroit, Mich.—Mason & Rice, architects, of Griswold street, are now taking estimates on a proposed new building to cost from $125,000 to $250,000.

Nashville, Tenn.—Plans and specifications have been prepared by H. J. Dudley for the erection of a $150,000 apartment house for Wm. H. Jackson.

Wilkesbarre, Pa.—Proposals for the erection of a steam heating plant for the Central Poor District of the Retreat have been received as per specifications at store of Louis Tisch in the city of Wilkesbarre. Abram Nesbit, secretary, Kingston, Pa.

Cleveland, O.—The Dettlebach Stove Co. will build an eight-story apartment house at Huron street and Euclid avenue, to cost $125,000. No architect has yet been engaged to furnish plans.

La Crosse, Wis.—A steam heating plant will be put in at the County Poor farm.

Pittsburgh, Pa.—J. F. Osterling of Pittsburgh has been chosen as architect for the Home for the Feeble Minded, to be located at Polk, Pa., Norman Hall, of Sharon, Mayor Horace Rose of Johnstown, and George W. Guthrie of Pittsburgh are committee.

Washington, D. C.—R. Harris has taken out building permit for a $25,000 brick dwelling to be located at 1532 16th street.

Brooklyn, N. Y.—Mary S. Buckley of 287 Tenth street will build a four-story brick flat and stores at Fifth street near Second avenue, to cost $27,000.

Columbus, O.—D. H. Burnham & Co. of Chicago, Ill., have made plans for an eleven-story $150,000 business block for John G. Deshler, to include steel frame work, electric light, hydraulic elevators, and marble floors.

Welch, McDowell County, W. Va.—Bids are invited for the erection of a new Court House and Jail as per plans of Frank P. Millburn of Catlettsburg, Ky. Proposed cost of both buildings, $47,700.

New York, N. Y.—Architect Geo. B. Post has made plans, which are now in the possession of Dr. Samuel H. Monell of 665 Lexington avenue, for a medical building, to cost $1,000,000, and to be built this summer somewhere near the Grand Central Depot. It is stated that Cornelius Vanderbilt will supply most of the necessary funds.

Salisbury, Md.—The contract for building the new court house at Snow Hill has been awarded to Thomas M. Slemmons and A. W. Lankfor of Salisbury, Md., at $23,268 for the court house and $3,544 for the jail.

Brooklyn, N. Y.—John Englis & Son of 196 Clinton avenue will build four brick dwellings on Clinton avenue near Myrtle to cost $30,000.

Cedar Point, O.—H. E. Siter of Third and Walnut streets, Cincinnati, O., is architect for the proposed $36,000 seminary for St. Gregory's congregation, to be built at Cedar Point.

Milwaukee, Wis.—Dr. Horace H. Brown of 418 Jefferson street will erect a $20,000 hospital at Prospect avenue and Woodstock place.

Philadelphia, Pa.—W. J. Shedwick will soon begin work on forty houses on 44th and Aspen streets, to cost $250,000.

Utica, N. Y.—The Supervisors of Oneida County have accepted the plans of Architect Jacob Agne, Jr., of Utica, N. Y., for proposed new county buildings to be located on the Bell farm, to comprise four buildings.

Syracuse, N. Y.—The ground is being laid out for the proposed business block for Chas. H. Warner, to be erected at Franklin and West Fayette streets, as per plans of architect Archimedes Russell.

New Bedford, Mass.—The contract for erecting the new building of the Southern Massachusetts Telephone Co. in New Bedford has been awarded to John A. Jackson of Brockton, Mass., and he has also been awarded the contract for erecting the telephone exchange in Fall River. Frank W. Weston of Boston, Mass., is architect.

Cincinnati, O.—Henry Huhlhamer of the Lion Brewery will build a $30,000 office building from plans of Jas. W. McLaughlin.

Grand Rapids, Mich.—F. J. Woof will erect a $25,000 business building.

Minneapolis, Minn.—Orff & Jerolomon are making plans for an apartment house of fifteen flats for J. A. Bohn. W. S. Burt will erect two apartment houses on Park avenue to cost $200,000.

Worcester, Mass.—Thos. H. Hall has completed plans for a new block to cost $18,000, to be located on Wellington street near Main street, to be four stories high, and to contain eight tenements of five rooms each, to be steam heated.

Erie, Pa.—The work of remodeling the Noble block was begun May 1st, and $40,000 will be spent for improvements.

Cleveland, O.—The Hon. H. B. Perkins of Warren, O., will erect a power block or stores on Frankfort street, as per plans of Cabum & Barnum, 40 Blackstone Building, Cleveland. Figures are now being taken, to include plate glass, freight elevator, boilers, pipe covering, and iron shutters. A $25,000 laboratory will be erected on the grounds of the Western Reserve University, as per plans of C. O. Schweinfurth, 37 Blackstone Building.

Buffalo, N. Y.—The contract for erecting the new building for the Bank of Commerce has been awarded to Henry Schaefer's Sons at $50,000.

Bridgeport, Conn.—The Directors of the Bridgeport Hospital propose to build a $25,000 addition, with funds the gift of Miss Mary Wood, to include operating room, elevator, and all modern improvements.

Auburn, N. Y.—The bill of Assemblyman Wilcox has passed the Assembly, appropriating $28,000 for enlarging the armory at Auburn, to include new truss roof.

New Bedford, Mass.—Chas. O. Brightman has taken out building permit for new $95,000 St. Luke's Hospital at Page and Allen streets, from plans of Wheelwright & Haven, of Boston.

Detroit, Mich.—S. C. Falkinburg of 419 Hammond building is architect for three stores and 18 dwellings to be built on Grand River avenue, to cost $60,000.

Brooklyn, N. Y.—Jeremiah Gilligan of 545 First street proposes to erect six brick dwellings at Second street and Eighth avenue, to cost $54,000.

Boston, Mass.—Andrewz, Jacques & Rantoul have made plans for a $40,000 club house for the Boston Athletic Association, to be located in Weston, to include hall, billiard rooms, and dining rooms. The committee are G. W. Beals, G. B. Morrison, and M. L. Pratt.

New York, N. Y.—Architect J. W. Farnsworth is making plans for an 18 story office building to be erected at Greenwich and Thames streets for John Pettitt, to cost $400,000. He is also making plans for a $40,000 office building at Beekman and Pearl streets. Architect Chas. F. True is making plans for eight brick dwellings to cost $142,000, to be erected at West End avenue and 100th street, for C. G. Judson of 48 West 73d street.

Utica, N. Y.—The Oneida county supervisors are about to erect county buildings to cost $100,000.

Philadelphia, Pa.—The Evening Home Association of the First Unitarian church, on Aspen street, will erect a $40,000 stone building.

Hartford, Conn.—The plans of Brooks Lincoln of Hartford have been accepted for the proposed Masonic Temple, to cost $50,000. Bids will soon be asked. Chas. E. Billings is chairman of the general committee.

Buffalo, N. Y.—Architect W. H. Archer has made plans for the proposed new church home to be built at Front avenue, Seventh and Rhode Island streets, to be of brick and three stories high, to include laundry, heating apparatus, kitchen, reception rooms and dormitory. The building will be of 105 by 108 feet, of brown sandstone. The Board of Managers of the Home is Thos. Lathrop, M.D., Rev. F. Lobdell, Rev. W. A. Hitchcock, Wm. H. D. Barr, Martin Clark, and Geo. A. Stringer, Cambridge, Mass. The Cambridge Field Company will erect a four-story brown stone apartment house on Front street, Cambridge. It will accommodate eight families, and will cost $40,000. The directors of the Cambridge Field Company are Col. Albert Pope, Henry D. Hyde, and G. T. W. Braman. Brock Brothers will build two modern dwellings to cost $20,000 at Irving and Cambridge streets.

Mills and Factories.

Brooklyn, N. Y.—Silas A. Ilsley of 175 Pearl street, New York, will build a seven-story brick factory at York and Adams streets in Brooklyn.

Appleton, Wis.—The Kimberley & Clark Co. will soon make great improvements in their mills, but no contracts have yet been let. A new engine and two or three new boilers for the proposed new engine house will be added.

Rumford Falls, Me.—The Rumford Falls Chemical Association will expend $300,000 for enlargements to their plant.

South Norwalk, Conn.—Architect Wm. S. Knapp is at work on the plans for the new buildings of the Crofut & Knapp Co. on Water street. The present main building will be enlarged by an extension 76 by 54, of brick, with slate roof, and three stories high. Back of this will be erected a four-story building, with engines, boilers, dry rooms, etc., 36 by 56, also of brick, and there will also be a one-story frame plank shop. It is likely that the buildings will be erected by day work.

Rome, N. Y.—The Rome Locomotive & Engine Co. have decided to begin at once the rebuilding of their machine works at Rome. Hon. Edward Comstock and Thos. H. Stryker of Rome will give details.

Chicago, Ill.—Plans and specifications have been made by Flanders & Zimmerman for the erection of a $25,000 condensing factory for the Illinois Condensing Co. D. Buchanan, 8 Wabash avenue, is manager.

Warren, O.—The Paige Tube Co. will expend $250,000 for improvements.

Perth Amboy, N. J.—It is stated in the Perth Amboy Democrat that M. Guggenheimer & Sons of New York will establish here a $1,000,000 refinery for copper, lead, and silver.

Newark, N. J.—Unger Brothers will build a five-story addition to their factory on Beecher street. Building contracts are let; equipment and machinery will be wanted.

Grand Rapids, Mich.—Frank H. Sweet has purchased a site in South Grand Rapids for the erection of a furniture factory. He will succeed to the business of the Sweet Furniture Co. The new plant will cost $200,000 and be ready for business July 1st.

Quincy, Ill.—George H. Stahl has decided to build an incubator and interior woodwork factory, to cost $40,000.

Niagara Falls, N. Y.—The Niagara Falls Hydraulic Power & Manufacturing Co. have applied for permission to string wires to furnish light, heat, and power for manufacturing purposes.

Jersey City, N. J.—The Wheelman's Protective Co., $500,000, incorporated, and will build a factory in Jersey City. J. W. M. Green, W. C. Gloss, Eugene Green, W. D. Reynolds, of Jersey City.

Mahanoy City, Pa.—The Bartholomay Brewing Co. of Rochester, N. Y., will build a large branch brewery in Mahanoy City.

Washington, D. C.—The F. C. De Prenyal Gas Range Mfg. Co. will open a large factory at Back River, and will establish a branch office in Baltimore. The head office will be in Washington.

Scranton, Pa.—The Sperl Heater Co. have decided to locate a plant in Scranton, and work will begin at once.

Mommouth, Ill.—Sealed proposals will be received for erection of a boiler house and tunnel work required for Court House building for Warren county to May 18th, as per plans at office of W. H. Sexton, county clerk.

Chicago, Ill.—Wolf, Lehle & Co., No. 550 Halsted street, architects, are taking bids on a five story brewery, to cost $100,000, to be built for C. F. Jeusch of 305 Ashland Block, at East Chicago avenue and River street.

Troy, N. Y.—John Stanton will erect a three-story brick brewery to cost $100,000, and have a capacity of 300 barrels per diem.

Jeannette, Pa.—The contract for the new glass plant to be built for McKee & Brother has been let to Matthews & Nichols of Wellsburgh, W. Va., at about $100,000. There will be three buildings.

Minneapolis, Minn.—The Machinery Construction Co., $200,000, will soon erect a plant here. C. M. Loring, C. H. Budwell, of Minneapolis, Minn.

Chicago, Ill.—The Roth & McMahon Company will soon begin work on a seven-story factory, to run from Jackson to Quincy streets near Halsted, to cost $70,000. Martin E. DeTamble, 121 So. Clinton street, will give details.

Ogdensburg, N. Y.—The Ogdensburg Cold Storage Co., incorporated, $20,000, to build storage ware houses and lease them, and to build and operate creameries; principal office Ogdensburg. Cephus Nightingale, John M. Kellogg, Alfred W. Gray, of Ogdensburg.

Niagara Falls, N. Y.—The Niagara Falls Hydraulic Power Co. has resolved on the development of 10,000 horse-power in the gorge below the falls, and will erect a mammoth iron building for manufacture, to cost $250,000.

Oelwein, Iowa.—A land company has been formed of which Judge George Bayliss of Chicago, Ill., is a leader, and a contract has been made with the Chicago and Great Western R.R. whereby the latter will expend $200,000 for erection of shops at Oelwein.

Schools and Colleges.

Tamaqua, Pa.—A handsome high school will be built here.

Asbury Park, N. J.—The high school trustees will soon take action in the matter of the plans submitted by Poole & Sutton of Newark, N. J., C. Powell Carr of New York and Pierce & Brum of New York.

Boston, Mass.—The sum of $100,000 has been appropriated for a new school in the Hancock district.

Bethel, Conn.—Two new schools, to be of brick and to cost not over $30,000, will be built from plans of Architect Sunderland of Danbury. The following are the Building Committee: Arthur Judd, Andrew J. Hallock, Edward Richmond, Samuel S. Ambler.

New York, N. Y.—Governor Flower has signed the bill allowing New York to issue $1,000,000 in bonds for additional schools.

East Stroudsburg, Pa.—J. T. Lacey of Binghamton, N. Y., has made plans for a $25,000 addition to the East Stroudsburg school.

Springfield, N. Y.—It has been decided to build a $15,000 school.

Woodside, L. I., N. Y.—John T. Moore of Greenpoint, L. I., has the contract to build a $19,500 school for this place.

Northampton, Mass.—It has been decided to build a $30,000 high school, likely at South and Main streets. A set of plans has been submitted to the City Property committee, but they have not yet been accepted.

McKeesport, Pa.—Contract for new school has been awarded to Daniel Stratton at $32,000.

Baltimore, Md.—J. Theo. Oster, inspector of buildings, calls for proposals for erection and completion of the Western Female high school, also for the placing therein of a heating and ventilating system.

Ridgewood, N. J.—The sum of $28,000 for building, $2,000 for furniture, and $1,400 for incidentals for the proposed school at Franklin avenue and Beach street has been voted.

Buffalo, N. Y.—Architect Bethune has submitted plans for proposed addition to Public School No. 38 at Vermont and Lowell streets, to cost $26,442.

Bethel, Conn.—Gideon S. Peck of the Board of Education will give details of two proposed new schools.

Schwenksville, Pa.—A new brick school will be built at Schwencksville this summer, to be heated by steam.

Woonsocket, R. I.—Wm. F. Hubbard has been awarded the contract to build the $19,500 school on Gaulin avenue.

Cincinnati, O.—A $70,000 school for Bishop Elder of 8th and Plum streets will be built from plans of Louis Pickett.

Mansfield, O.—Bids will be received to May 26th for the erection of a six-room addition to the Bowman street building, also a two-room addition to the Newman building.

Newark, N. J.—The plans of Architect Gustavus Staehlin for the proposed Seventh ward school, to cost $20,000, to be located at Fifteenth avenue and Fourteenth street, and of Architect Harry J. King for the proposed Eighth ward school, to be located at Waverly Place and Charlton street and to cost $20,000, have been accepted.

Buffalo, N. Y.—School buildings will be erected here as follows: one on Main street, one on Barry place, one on Guilford street. John E. Ramson, secretary of the Board of Public Works, will give details.

Knoxvills, Tenn. The plans and specifications of W. Chamberlain & Co. have been accepted for the proposed Knoxville College and Dormitory, to cost $30,000.

Buffalo, N. Y.—Superintendent Meyers of the Bureau of Building has prepared specifications for a new sixteen-room school house on Guilford street, between Broadway and Sycamore streets, to cost $45,000; for a sixteen room school on Barry place, between Bird and Forest avenues, to cost $45,000; and for a twelve room building on Main street, between Jewett avenue and Oakwood place, to cost $40,000.

New Haven, Conn.—Plans for additions and improvements to the Hillhouse high school, Orange street, are ready and contracts will soon be awarded as per plans of Architect Robinson to include new heating and ventilating apparatus.

Brooklyn, N. Y.—Rev. Father Hanselman, pastor of St. Benedict's Church on Fulton street, near Ralph avenue, has raised $80,000 on mortgage, to be used for building a parochial school. Monsignor May, pastor of Holy Trinity church on Montrose avenue, is raising funds for a parish building to cost $50,000, to be erected near the church, and work soon to be begun.

BUSINESS NOTES.

Mark Dean, publisher of the well-known "Steam Fitters' Reference Hand-Book," is now connected with the New England office of the Herendeen Mfg. Co.

E. K. Barr, Philadelphia representative of the Herendeen Mfg. Co., moved April 1st. to 1019 Betz Bldg., that city. He has been meeting with first-class success in the Quaker city and vicinity, and reports the outlook for fall trade good.

The American Boiler Company, of 51 Centre Street, New York, have engaged Parlor 217 at the Broadway Central Hotel. All their salesmen and engineers will be on hand to welcome and entertain customers and visitors who may drop in during the Master Steam Fitters' Convention.

We are in receipt of catalogue No. 3, sent us by the Kewanee Boiler Co., Dearborn and Lake streets, Chicago, who manufacture horizontal, vertical, and fire box boilers for power and heating. A special boiler which they are pushing in this trade is called the Haxtun, on which they are making a great run. They also manufacture the Anderson steamer and water heaters, a line of receiving tanks, compression tanks, air receivers, water-gas outfits, etc. The catalogue is a book of 130 pages, neatly bound, and, besides containing prices of their goods has a very complete price-list of radiators, feed pumps and receivers, regulators, tanks and valves, with a complete index. Everyone interested in supplies of this sort, should have a copy to which to refer.

Blake & Williams have removed to the new building 186–188 So. 5th avenue, between Grand and Broome streets, New York City.

Hereafter the Ætna Foundry & Machine Co., of Warren, Ohio, will manufacture steel ranges and hot air furnaces, instead of machinery.

The Vanderman Plumbing & Heating Co., held their annual meeting at Willimantic, Conn., on May 2nd. The following officers were elected: A. J. Fowler, president; Darius Shea, vice-president; John Riley, secretary; Wm. Vanderman, treasurer and manager. A six per cent dividend was declared.

Although P. J. Moran, the well-known fitter, of Salt Lake City, Utah, was higher in bidding for the ventilation of the Grant school, that city, his reputation as one who did only first-class work has secured him the contract at $5,692.28. He has also been awarded the contract for the steam heating apparatus for the new City Hall at Rock Springs, Wyoming.

The Globe Ventilator Co., of Troy, N. Y., send us their new catalogue, in which the various phases of the subject of ventilation are discussed. Churches, schools, residences, factories, foundries, machine shops, halls and assembly rooms, theaters, opera houses, etc., where this company have placed their ventilators, are shown by illustration of practical work. Prices, etc., follow. All our readers interested in ventilating apparatus should have this little work, which will be sent free upon application.

American Plumbing is the title of a book by Alfred Revill which tells how to make joints of all kinds, how to make traps and bends, how to provide for varying head of water, how to run pipes, how to arrange vents, how to find defects, to make repairs and to test plumbing work. It also gives laws and rules governing plumbing. In short it is a compendium of practical plumbing, giving in detail everything of importance in modern plumbing Large 12mo, cloth, 225 pages, 138 illustrations. Price, postpaid, $2. Excelsior Publishing House, publishers, 29–31 Beekman street, New York.

Hart & Crouse, 211 Water street, New York City, report through their manager, Mr. W. M. Mackay, the following recent sales of Royal steam and water heaters: Wood Bros., Fishkill, N. Y.; F. Samuelson, Arlington, N. J.; Mr. Henry Dickson, Newark, N. J.; W. H. Clark, Lebanon, Pa.; Daniel McGurl, Pottsville, Pa., two heaters; German Methodist Parsonage, Dutch Kills, Long Island City, L. I.; Bogle & Scott, Cor. Hudson and N. Moore streets, New York City; Virginia Plumbing and Heating Co., Roanoke, Va.; Dr. W. B. Johnson, Paterson, N. J.; A. L. Thrall, Jamestown, N. Y.; Paul Gantert, Palisade Park, N. J.; Geo. Devlin, Ravenswood, Long Island City, L. I., Rudolph Guggenheimer, 101st street and Madison avenue, New York City, two heaters; Mr. Montgomery, West 74th street, New York City; besides a number of others. They report business on the increase.

Suburban and Country Homes is the name of a very interesting book which should be in the hands of every intending builder. It is of interest to architects, containing as it does 45 plates showing designs for houses of moderate cost, with descriptive letterpress, contributed by various architects, besides an article on Suggestions on House Building by Albert Winslow Cobb, architect, and an article by Leonard D. Hosford, entitled How to Plumb a Suburban House Safely, Economically and Effectively, together with plans and specifications which may, with slight modification, be adapted to almost any suburban dwelling costing from $4,000 to $8,000. This book is first class in every respect, and can not fail to be of value to those who buy a copy. One oblong quarto, handsomely bound in cloth, $2; in paper, $1. William T. Comstock, publisher, 23 Warren street, New York.

"Four Track Series" Etchings.—The passenger department of the New York Central has just issued a series of eight beautiful etchings, which, artistically, outrank anything of the kind ever issued by a railroad company, while the absence of any objectionable advertising feature renders them suitable to hang in your office, library or home. The titles are Washington Bridge, Rock of Ages, Niagara Falls, Old Spring at West Point, Rounding the Nose, Mohawk Valley, No. 999 and the De Witt Clinton, The Empire State Express, Gorge of the Niagara River, and Horseshoe Fall, Niagara. These etchings are all printed on fine plate paper, 24 by 32 inches, suitable for framing. Copies may be procured at the office of George H. Daniels, general passenger agent, Grand Central Station, New York, for fifty cents each, or will be mailed in stiff tubes, secure from injury, for seventy-five cents each, or any two of them to one address for $1.30, or any three or more ordered at one time, to one address, sixty cents each, in currency, stamps, express, or postal money order.

The Twenty-third Annual Convention of the National Association of Stove Manufacturers was held in Chicago the first week in May. Members of the leading stove manufacturers throughout the country were present. The session was opened at 10:30 A.M., May 2nd, by President Geo. D. Dana, of St. Louis, whose address outlined the events of the year. Secretary Thomas' report of the official work of the association was received, together with recommendations for the action of the convention. A paper on the "Interchange of Information and Experience between Stove Manufacturers" presented by the Fuller & Warren Co. was discussed. It was followed by a paper on "Cleaning Castings" by Abram C. Mott, president of the Abram Cox Stove Company. Henry Cribben read a paper on "The Education and Production of Efficient Workmen." The convention passed a resolution that current prices and terms on stoves be firmly maintained during 1894. On Thursday Leon Gobeill of Cleveland, O., read a paper on "A Theory of Ornamental Design as Applied to the Decoration of Stoves," illustrated with diagrams. Considerable discussion was evoked by the reading of a paper by Chas. S. Prizer of Reading, Pa., on "Profit Sharing." The following officers were elected for next year: president, George D. Dana, St. Louis, Mo; first vice-president, Lazard Kahn, Hamilton, O.; second vice-president, Francis Kernan, Utica, N. Y.; treasurer, W. S. Stevenson, Philadelphia, Pa.; secretary, D.M. Thomas, 80 Broadway, New York; board of management, H. W. Buttorff, Nashville, Tenn., Henry Cribben, Chicago, Ills., C. A. DuCharme, Detroit, Mich., Fred Will, Rochester, N. Y., W. E. Walker, Taunton, Mass. Chicago was selected as the place for the next meeting.

The Samuel I. Pope Co. have removed from 360 Dearborn street to suite at 207 Medinah Temple Building, Jackson and Fifth avenues, Chicago, Ill.

The Smith Heating and Ventilating Co. of 502 Exchange Bldg., Boston, Mass., have opened an office in the Metropolitan Life Insurance building, Madison Square, New York.

J. E. Lonergan & Co., manufacturers of the Lonergan valves and steam specialties, report business as picking up, and seem to feel that the worst of the depression is over.

Mr. Henry Houtaling, formerly with the Detroit Heating and Lighting Co., and afterwards with the Gurney Hot Water Heater Co. is now connected with the western office of the A. A. Griffing Iron Co.

The Kernan Furnace Co., Utica, N. Y., is represented on the road by Harry King, who has the faculty of securing many good orders, and who is well liked in the trade.

J. E. Sweeting, representing the Hilt's Wrench & Paper Cutter Co. of Richford, N. Y., will attend the coming Master Steam Fitters' Convention to be held in New York city, and will exhibit the Hilt wrench.

The Instantaneous Water Heating Co. of Chicago, have opened a New York office at 183 Broadway, where they will carry a full line of Douglass and Acme heaters for heating water for domestic purposes. Mr. E. Brownhill will be the eastern manager.

The Globe Steam Heater Co. of North Wales, Pa., have just issued a new catalogue entitled, "Greeting, 1894 and 1895," containing a description of their sectional steam and hot water boiler, lists of sizes, capacity and price. This catalogue will be sent free if you mention HEATING AND VENTILATION.

J. H. Davis, for years with Baker & Smith Co. and F. W. Lamb Co., of Chicago, and later with the American Heating Co. of St. Louis, will hereafter manage the Chicago store of the Standard Radiator Co. of Buffalo. The new offices will be located at 167–169 Lake street.

D. A. Bridge, formerly with the John Simmons Co., and C. D. Smith, formerly with the A. A. Griffing Iron Co., have formed the American Heating and Construction Co., and have opened offices at 69 Centre street, New York. They will make a specialty of piping for power heating, and refrigerating work.

The Hartford Steam Boiler Inspection & Insurance Co., since they began in business, have made 796,725 visits of inspection; inspected 1,580,060 steam boilers; made 608,786 complete internal inspections; tested 102,195 boilers by hydrostatic pressure; found 1,206,309 defects, of which 154,749 were dangerous, and condemned 8,406 boilers.

We regret to announce the death of Birdsill Holly, inventor of the Holly system of heating, who died at his home at Lockport, N. Y., on April 27th. Mr. Holly, during his life, took out over 150 patents, many of which have made fortunes for their purchasers. The American District Steam Co. of Lockport, N. Y., is one of the large companies working under his system. Mr. Holly died comparatively a poor man, not being worth over $50,000.

C. F. Bachler, general agent for the Monitor Steam Generating & Mfg. Co. of Landisville, Pa., with offices at 49 North Seventh street, has sent us a novel testimonial on their heaters, which consists of about three yards of closely printed matter. It is certainly a unique scheme, and all interested should send for one. Mr. Bachler is heating a new house belonging to Mr. C. R. Carver of Buckingham, Pa., with Monitor boilers.

The committee appointed by the Smith & Winchester Co. of Boston, Mass., to choose the best and most appropriate name suggested by the trade for their new heater has reported in favor of the name Winchester, which was suggested by 52 different persons. The first one received was from Charles O'Grady of Marlboro, Mass., who is therefore entitled to the heater which was offered as a prize to the one who should first suggest the name adopted.

Messrs. Thompson Bros., 112 Bread street, Philadelphia, Pa., have completed the heating and ventilation of the Philadelphia Normal School for girls at 13th street and Spring Garden, the system installed being a mechanical one, with direct radiation in exposed parts of the building, while the whole is controlled by the Johnson thermostat heat regulating system. This system has become so popular that the Board of Education is laying out all the Philadelphia schools to be equipped in the same way.

The School Building Co. is the name of a new corporation which has opened offices in the Metropolitan Life Insurance Bldg., Room 605, Madison Square, New York. This company proposes to devote itself entirely to the building of schools, furnishing plans and specifications for the entire work. As the new company is composed of men of wide experience in this line of work, superintendents of school boards and all others who have charge of the building of contemplated schools will find it much to their advantage to consult with members of the new company and profit by their extensive engineering and architectural experience.

The following manufacturers will exhibit their specialties at the Master Steam Fitters' Convention to be held at the Broadway Central Hotel, New York, June 19, 20, and 21: American Radiator Co., Chicago and New York; A. A. Griffing Iron Co., Jersey City, N. J.; Fowler Radiator & Mfg. Co., Philadelphia, Pa.; Jenkins Bros, New York; U. S. Heater Co., Detroit, Mich.; E. Rutzler, New York; Richmond Stove Co., Norwich, Conn.; Abendroth Bros., New York; Thayer Heater Co., Boston, Mass.; Gurney Hot Water Heater Co., Boston; Abram Cox Stove Co., Philadelphia, Pa.; Hilt Wrench & Paper Cutter Co., Richford, N. Y.; and others.

We are pleased to announce that the following papers have been promised for the next convention of the Master S. & H. W. F. Ass'n. of the U. S. to be held at the Broadway Central Hotel, New York, June 19th, 20th and 21st. "Warming and Ventilation," David M. Nesbit, London, England; "Difference in Radiating Surface Required to Warm Buildings of Poor and Good Construction," E. P. Bates, Syracuse, N. Y.; "Types of Heating Boilers Used in the United States," Arthur C. Walworth, Boston, Mass.; "System in Office and Drafting Room," H. D. Crane, Cincinnati, O.; "Early Reminscences in Hot Water Heating," John B. Farnsworth, Leominster, Mass. A number of other papers have been promised but as yet the titles have not been given.

Facts and Theories comes to us from W. C. Mowry, Norwich, Conn. Tells you how to burn only a little coal, says you get heat just the same. Try one.

Who makes the Home Comfort or Home Fortune steam or hot water heater? We want to know. Can any of our friends advise us? We will appreciate it if they can.

Why don't you send to the Gurney Hot Water Heater Co., 163 Franklin street, Boston, for an identification card? It don't cost you a cent, and is an excellent thing to have on your person in case you meet with an accident of any kind.

E. M. Link & Co., of Erie, Pa., have completed a heating and ventilating plant for the Otsego Fork Mills Co., at Girard, Pa. The heater is a seven-section one, and the fan a 100-inch, directly connected to engine

M. Mahony, of Troy, N. Y., is on deck again with his calendar for June, which suggests the balmy sea shore breezes, and the fact that now is the time to arrange for the boiler you should put in before the weather freezes.

The Iron Clad Paint Co., of Cleveland, O., send us a little circular, giving an analysis of their dry paints, and calling attention to their ready mixed Iron Clad paint. The company is an old one, having been in business since 1871, and refer to some very large consumers as to the quality of their goods.

Mr. J. C. Henderson, of Troy, N. Y., has received some very fine voluntary testimonials regarding the working of his steam boiler during the last winter. The construction of Mr Henderson's boiler is almost entirely different from that of many, and it will no doubt meet with a successful sale.

The John Simmons Co., of 106 to 110 Centre street, New York city, send us their latest addendum to their catalogue, which is a description, with prices, of their cast-iron drainage fittings threaded for iron pipe, and pricies and sizes of the Netherland pipe hanger, amply illustrated with cuts. It is free to you.

At the Block & Baird office building, Pittsburgh, Pa., is an interesting installation of house heating boilers, consisting of two No. 25 Gorton hot water boilers, set in twin connection. The apparatus was put in by McGuinness Smith of that city, and has given the utmost satisfaction.

Raymond & Campbell, Middletown, Pa., with New York store at 244 Water street, send us their new "Sun" steel steam and hot water boiler catalogue. The work is one of 110 pages, and is amply illustrated with cuts showing sectional and full details of their apparatus. Many testimonials follow. They will be sent free if you mention H. & V.

The Economy Light, Heat, and Power Co., of Scranton, Pa., has contracted with the American District Steam Co., of Lockport, N. Y., for the construction of a steam heating and power plant with underground mains (Holly system) to cost $150,000. The officers of the company are Wm. Connell, president; Lemuel Amerman, vice-president; Lieut.-Gov. Watres, treasurer; I. H. Burns, secretary.

Martin Bing & Co., of Tarrytown, N. Y., have taken the exclusive agency for the sale of the Furman boilers for Tarrytown, Sing Sing, Hastings, Irvington, White Plains, and Dobbs Ferry. Edward W. Martin, formerly with the Fiske Plumbing & Heating Co., is engineer for the company, which is of itself a guarantee for good work.

The S. Wilks Mfg. Co. of 113-123 South Clinton street, Chicago, have shipped a large heater and tank for the Young Men's Christian Association bath rooms at Cumberland, Md., and also another large heater and tank for the Young Men's Christian Association at Memphis, Tenn., and four heaters for the officers' quarters, etc., for the United States Government at Fort Riley, Kansas; also four 16 by 36 self feed hot water heaters, with automatic damper regulators, for the U. S. barracks at Plattsburgh, N. Y. They send us a large number of testimonials they have received, which are most excellent.

The Evans Pure Air Furnace, What It Does, and How It Does It, comes to us from Philadelphia, Pa. After briefly describing what we are accustomed to, relating to the faults of some furnaces, the reasons why the Evans "gets there" are noted. Bringing the cold air in next to the smoke pipe, doing away with objectionable pieces which obstruct a look at the fire, and providing, where necessary, screws and bolts of brass, non-rustable, necessary boiler tubes for air passages, a grate that can be dumped or shaken in three parts, gas tight joints, etc, are some of the points of general construction. Why don't you send for a catalogue?

The St. Louis Radiator Mfg. Co. are just completing the delivery of 8,000 feet of St. Louis radiation to the new Columbia Club, St. Louis, Alfred Rosenheim architect, and have also completed the delivery of 10,000 feet to the new Collier building, of which Messrs. Peabody, Stearns & Furber are the architects. These two buildings are representative of the new type of architecture. The season just closed was eminently satisfactory to them as their first in business, and from present indications they look for a much increased volume for the season of '94, if the inquiries and orders they are now receiving can be taken as a criterion.

The Harell Steam Heating Co., of Dunkirk, N. Y., have by special act of the legislature, assumed the name United States Radiator Co. As they were manufacturers of cast iron radiators, exclusively, the name Harell Steam Heating Co. was a misnomer, the trade assuming from the old name that they were engaged in the steam heating business. The new name is very appropriate. Despite the unfavorable business conditions, this company is erecting new buildings and largely increasing their output in order to meet the demand for their "Splendid" radiators. In the near future they will issue a catalogue illustrating and describing the different specialties they make, and will be pleased to mail a copy to any address when ready.

Since the Barron Steam Heating Co. removed to the Cable building, Broadway and Houston streets, the ever-versatile Hugh Barron has been hard at work on a new catalogue of exactly what he has for the trade, and complete as it is, lying on our desk, "we wouldn't miss it for nine dollars." Seriously, Mr. Barron has given the trade a work that contains three very important papers on "Variation in Practice," "Crude Thoughts on Crude Engineering," and "A Look Ahead," which he has read at the Steam Fitters' Conventions at various times; and besides that for the first time shows, with illustrations, some new specialties that we believe the trade will welcome. It don't cost you a cent.

The Kelsey Furnace Co., of Syracuse, will at once bring out a new size of their furnace, the fire-pot being twenty-one inches.

Messrs. Powers & Messervy, of Chehalis, Wash., are putting a Royal steam heater in the new West Side school at that town.

The Stover Heater Co., Freeport, Ill., have opened an office at 89 Lake street, Chicago. Mr. John Tubman will manage the office.

J. D. Stiles, of Jenkins valves, has been doing New York state duing the last week, and as usual keeping up the popularity of the Jenkins specialties.

"Tom" Cushing says business is picking up fast, that the outlook is for larger sales in his line than for years past, and he says this is a true story, too.

O. T. Sloteman of Buffalo is not yet established in his new factory, but preparations are being made to push the manufacture of his boilers at once.

Messrs. Dugan Bros., Salem, Or., are placiug a Royal hotwater boiler, manufactured by Hart & Crouse in the Oregon Soldiers' Home at Rosebury, Oregon.

The Herendeen Mfg. Co. of Geneva are giving away to the trade a neat little card case which fills a long-felt want. We acknowledge the receipt of one with thanks.

The New York Central Iron Works, of Geneva, are bringing out a new boiler, called the Dunning No. 6, with a sixty-four inch furnace. E. N. S. says they are still sawing wood.

Wm. Campbell, formerly with the Detroit Heating & Lighting Co., and afterwards with S. S. Jewett of Buffalo, has accepted a position with the Canton Furnace Co. of Utica, as heating engineer.

The Fuller-Warren Co. of Troy, N. Y., have sold, through W. O. Folson & Co., of Boston, two of their largest hot water boilers, No 350, to be in twin connection, for a large building in Boston.

The Ranton Boiler Co., of Syracuse, have a splendid working plant in the large block owned by Dey Brothers, that city, a test of which we hope to publish later. The Ranton Company will shortly be established in a new factory.

It is not generally known, but is a fact, that ground is (or is about to be) broken in New York city for seventeen office buildings, the lowest cost of the smallest being $600,000. The New American Tract Society building is the largest, being twenty-four stories high and to cost about $2,000,000.

Hayes & Falls, of Rochester, N. Y., have got out a new catalogue, describing the "Torrent," their new steel water-tube boiler for steam and hot water heating. The boilers have some excellent features, and are sold at a price to compete with the market. Send for a catalogue, mentioning H. & V.

The Peerless Steam Heater people, George H. Bell & Co., claim a great improvement in simplicity, uniform heating power, and cheapness of their heater. Their new catalogues contain many testimonials that are worth reading, and can be had at their New York address, 114 Nassau street.

The Superior Furnace Co., of Little Falls, N. Y., whose steel furnaces and combination heaters have been so well received by the trade, have gotten out a new hanger, which calls especial attention to their line. Any fitter who would like to have one to hang in his office or store, showing that he has a line of furnaces for sale, can secure one free, by addressing the company at Little Falls, N. Y.

The line of new catalogues which the Richmond Stove Co. are preparing for its agents has been increased by ones for Isaac Coffin & Co., Boston; Abram Knowles, New Bedford, Mass.: J. H. Alvord, Winsted, Conn.; the Fall River Steam and Gas Pipe Co., Fall River; and Paul P Patten, Salem, Mass. The catalogues are all complete, and fitters should send to the nearest office for a copy.

Hart & Crouse of Utica, N. Y., have broken ground for their new factories and will push them to completion at once. They have purchased 20 acres of property, so that they will have ample room for all time. Their new factory is 700 feet long, and will be one of the best equipped of its kind in the country. Mr. G. W. Hart of this company left for Europe on April 24th, and will visit Berlin, Hamburg, London, Liverpool, etc.

D. R. McCallum, formerly manager of the National Hot Water Heater Co. and late connected with the American Boiler Co. on the Pacific Coast, is now in New York. He is to assume the general management of the branch office of the J. H. McLain Co., manufacturers of the Canton heaters for hot water, steam, and hot air. The above company have secured an order through their San Francisco office for two Humber hot water heaters for the Whittier school, a state institution at Los Angeles, Cal.

The New York Warming and Ventilating Co. has been organized, with a capital of $50,000. The officers of the company are Mr. W. F. Wolfe, president; Mr. W. H. Knowlson, treasurer and general manager. The company will handle the Fuller and Warren system of heating and ventilation in New York, New Jersey, and western Connecticut. They will also contract for work, using any steam or hot water boiler desired. Mr. Wolfe needs no introduction, being known to the trade as the general manager of the New England Company, while Mr. Knowlson as manager of the New York branch has had unprecedented success. The company have already secured one contract of $75,000 at Millbrook, N. Y., it being the new building to be occupied as an opera house and high school, which is being built by Samuel Thorne, and of which Mr. Bruce Price of New York is the architect.

"Warmth for Winter Homes," U. S. Heater Co., Detroit, Mich., is the title of a beautiful little book, which comes to us by mail. The outside cover has a picture of the United States Capitol, which the company has adopted for a trade mark, and the frontispiece is a composite picture, showing Jefferson avenue residences, Detroit. The main body of the book opens with a timely article on hot water heating and the difference between it, steam, and hot air. Greenhouse heating is touched upon, and the smaller sized heaters for baths, coops, etc., are not forgotten. Suggestions as to proper radiators, ventilation, and especially in choosing a heater, we heartily commend to our readers. The company have, without reserve, explained all parts of their boilers and their advantages, and have not forgotten the "Mascot," their latest for small work. They will send this little book free to readers of HEATING AND VENTILATION.

The firm of Reardon & Ennis, manufacturers of the electric ventilator, located at Troy, N. Y., have dissolved. Mr. G. H. Ennis will hereafter manage the business.

The Bennett & Peck Heating & Ventilating Co. of 245-249 W. 5th street, Cincinnati, O., have recently closed a contract for a new school building in Morris, New York.

The Armstrong Mfg. Co. of Bridgeport, Conn., are having a ready demand for their improved pipe threading and cutting-off machines, and the catalogue of this concern should be in the hands of every fitter.

The latest postal traveller received from the United States Heater Co., Detroit, Mich., presents paragraphs from their new book, which is very uniquely gotten up and cannot fail to interest the prospective buyer.

The Thatcher Furnace Co., of 33 Peck Slip, New York, owing to their increasing business, moved on May 1st to 240 Water street, where they will have better facilities for exhibiting their line of goods and carrying a larger stock.

Who wants a neat little catalogue about brass pipe for plumbing? One which gives sizes to correspond with iron pipe and iron pipe fittings? Whoever does, write the American Tube Works, Boston. Say you saw it in H. & V. and get it free.

Upwards of fifty of the finest new buildings in Dayton, Ohio, including three new school buildings and five churches, the Dayton Club, the County Infirmary Building, etc., have been equipped with the Bennett & Peck system of heating and ventilation during the past year.

Cyclists will be interested in the bicycle lubricant which the Joseph Dixon Crucible Co. are shortly to put on the market in a solid form for the convenience of wheelmen who wish to carry it in their tool bag. It is made from their well-known graphite, and will no doubt meet the demand which has long been felt for some handy lubricant in a solid form.

The Gorton & Lidgerwood Co., 96 Liberty street, New York, manufacturers of the Gorton house heating boilers, will shortly issue a new edition of their book, "Modern House Heating," for which there will no doubt be a general demand. The work, typographically, will be one of artistic merit, and will contain a fund of practical information as to the best manner in which to heat dwellings and other structures efficiently and economically.

The new steam boiler catalogue just issued by Hart & Crouse of Utica, N. Y., and 211 Water street, New York city, has been received. It is similar to their hot water catalogue in the matter of its being well printed and on first class paper, containing illustrations of their steam boilers with instructions for setting up and using them, besides a treatise on low pressure steam heating by Mr. W. M. Mackay, with a few testimonials of parties using the heaters.

B. G. Carpenter & Co., warming and ventilating engineers and contractors of Wilkesbarre, Pa., have recently contracted for warming and ventilating the following buildings in Pennsylvania: Pennsylvania school, Harrisburg; Moyallen school, Wilkesbarre; Chestnut street school, Lancaster; high school, Ashley; North street school, Wilkesbarre; City Hall, Wilkesbarre; Nesbitt Hall, Kingston; Hospital, Wilkesbarre; high school, Morrisville; Market street schools, Berwick; Franklin street school, Wilkesbarre.

The First Lutheran Church Congregation of Cincinnati are erecting a new $65,000 edifice. As the church is being built in the middle of a square and will be surrounded by high buildings used for manufacturing, the problem of ventilation and heating was a difficult one. The contract was finally awarded to the Bennett & Peck Heating & Ventilating Co. The fresh air for the furnaces will be taken from a shaft extending far above the roof. The building will be lighted from a central dome, and thoroughly ventilated both in winter and summer.

Early in the month we received a call from Mr. E. N. Squires, the general manager of the New York Central Iron Works at Geneva, N. Y. Mr. Squires had lately returned from a trip to Florida, which was made in the nature of recreation, and had afterwards made a flying business trip to the West. He reported that the "Dunning" was being specified in a great many new contracts. One of the strongest testimonials we have ever seen, has been given his company by the United States officials of the Ogdensburg Barracks, stating that the boilers in use there had given most excellent satisfaction.

The Fox Furnace Co., of 28 Vincent street, Cleveland, Ohio, send us their new catalogue on warm air furnaces. These furnaces are the result of many years experience, and the favor with which they have been received during the past year is a source of great satisfaction. The company report that they do not know of a single instance in which the operation of the furnaces has not been successful. In the catalogue are descriptions and illustrations of furnaces for every fuel and climate, with testimonials from a great many of their users. If you are interested please mention this paper when writing for a catalogue.

The Ideal Boiler Co., whose offices are now at 36 Dearborn street, Chicago, is to be managed by Mr. George E. Downe, well known as the late vice-president and general manager of the American Boiler Co., and for years a leading factor in the heating trade. Mr. Downe knows a good thing when he sees it, and judging from the cuts of his boiler which we have seen, we believe he will be able to make the new heater well known, and secure a successful trade upon it within a short time. The company is capitalized at $100,000, and the business will be pushed at once. Their new catalogue and price-list are now in the hands of the printer, and will be ready for distribution in the very near future.

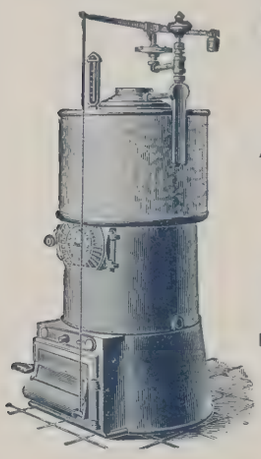
At the Annual meeting of the Joseph Dixon Crucible Co. held in Jersey City on April 16th, the old board of managers was re-elected, receiving almost a unanimous vote; there being a few shares not represented that were not cast. Remarks were made by some of the largest stockholders congratulating the management on the conduct of the affairs of the company during the last year, while the general business conditions were bad. The company, which was founded by Joseph Dixon in 1827 and organized as a stock company in 1868, manufactures graphite products of all kinds. The president of the company is Mr. E. F. C. Young, vice-president, John A. Walker, and the secretary is Mr. George E. Long.

W. R. Harmount, who was formerly the manager of the Detroit Lighting and Heating Co., is again in this country after a protracted stay abroad. He has not definitely decided as to the line of business he will follow, but as he was always known as a hustler, he will probably again enter the heating field, if his health permits.

WANTED.

Announcements in this department will be inserted at the uniform rate of twenty-five cents per line. For five or more insertions of the same advertisement we make a discount of 10 per cent. Calculate on nine words to a line.

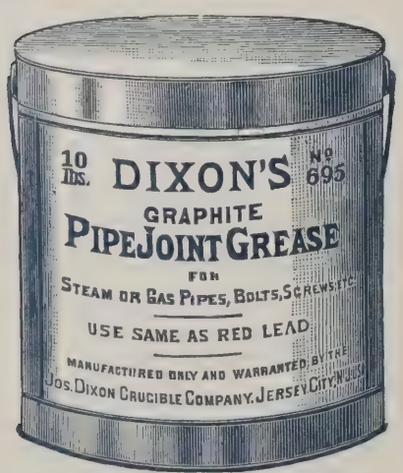
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The best and
ONLY
Self-regulating
Hot Water Heaters
on the market

FOR STEAM HEATING
Manufactured by.
The Wm. H. Page
Boiler Co.,
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THE CELEBRATED
BAY STATE FURNACES
POWERFUL,
DURABLE,
ECONOMICAL,
Barstow Stove Company,
BEEKMAN & WATER STS., NEW YORK.
PROVIDENCE, R. I. MANUFACTURERS, ESTABLISHED 1836. BOSTON, MASS.
Prices, Catalogues, and our interesting publication, "Fireside" mailed on application.



FAR BETTER AND CHEAPER THAN RED LEAD

Makes a tighter joint than red lead, that can be opened with perfect ease many years after.

Invaluable for all steam, gas and water piping, and equally useful for smearing gaskets on flange joints of meters, traps, and for bolts, screws, etc.

JOS. DIXON CRUCIBLE CO.,
JERSEY CITY, N. J.

One of the finest equipped buildings we have ever seen, which contains what is known as the dry closet system, is that of the East Orange (N. J.) High School, where about forty rooms are heated and ventilated by the Fuller & Warren system. It would well repay any heating engineer to see this building when in the vicinity.

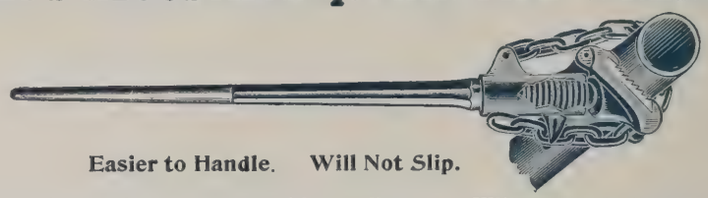
Edward E. Munro, formerly handling the Richardson & Boynton equipment in New York and vicinity, is now heating engineer for John A. Scollay of Brooklyn.

E. C. Hanrahan is now western manager of the Peninsular Stove Co., of Detroit. Chicago branch 79 and 81 Wabash avenue.

Alfred Emley of Emley & Sons, Ltd., Newcastle-on-Tyne, England, is now making a visit to the United States in the interest of his company.

George B. Cobb, 96 Center street, N. Y. City, has leased the store at 151 West 125th street, and will handle the Welsbach Light Co.'s system of lighting, as well as all manner of heating apparatus, making this the branch store.

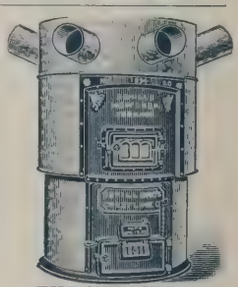
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Easier to Handle. Will Not Slip.

Rachet motion, and can be operated in small space. Will not crush the pipe.
Will do more work with less power than any other. No valuable time lost in grasping pipe as it is adjustable and goes to work immediately. Indorsed by the trade.
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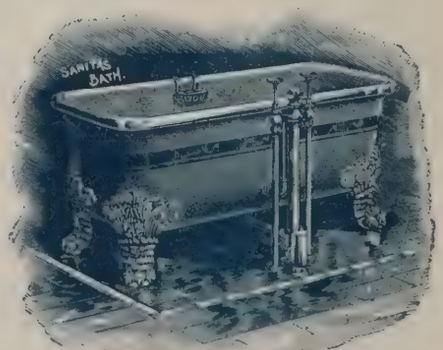


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FOR THE BATH ROOM
there is nothing equal to
THE SANITAS PORCELAIN BATH.

It is the perfection of **Cleanliness** and **Purity,** and when used in connection with our other Bath Room specialties it gives a combination unrivaled for sanitary perfection.

THE SANITAS TRAP is an ideal protection against **siphonage, back pressure** and **evaporation,** and is used in **Bath Tubs, Wash Basins, Sinks, etc.** The Sanitas Appliances are specified by the leading Architects of the country and are to be found in the best buildings. The co-operation of Plumbers everywhere is desired.



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SMITH & ANTHONY CO., Proprietors,
Boston, Mass.
56 Beekman St., NEW YORK.
217 Lake St., CHICAGO.

The Hohmann & Maurer Mfg. Co., of Brooklyn, N. Y., have increased their capital to $25,000. The new officers of the company are A. B. Hohmann, president; H. W. Maurer, general superintendent; Charles S. Redfield, secretary and treasurer.

Mr. Chas. A. Lathrop, New England manager for the A. A. Griffing Co., reports that he is "at home" at the new Boston headquarters, 177-179 Fort Hill Square; while Mr. Frank W. Somers has moved to his new quarters 34 Dearborn street, Chicago, where he is now able to show the trade a arger and better line than ever.

The Mulford Heater Co., will be represented n the road hereafter by W. D. Patty.

One of the great bones of contention in the heating trade is a proper air valve for radiators. We have lately seen a new mercury valve, which is the result of several years' experiment, and the expenditure of a large amount of money, which appears to do the work positively and well. It is now on exhibition at Thompson Bros., 112 Bread street, Philadelphia, Pa., and is the invention of Mr. D. F. Morgan, 30 North Fifth street, that city, who will shortly place it on the market.

FRED. P. SMITH, C. E.

Consulting Engineer for the Ventilation of Buildings.

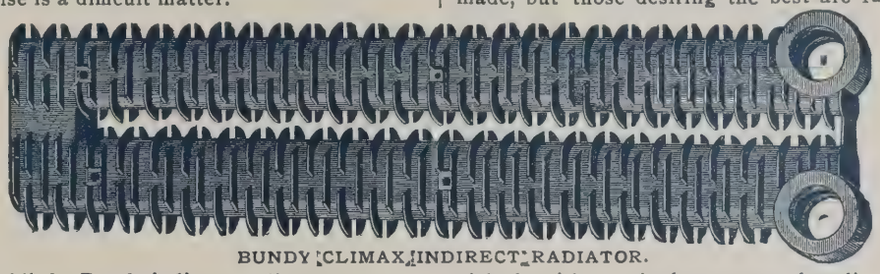
☞ Plans and specifications with skilled supervision and guaranteeing bonds furnished.

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When Coxey Comes Marching Home.

What a large amount of waste energy such as it is, is squandered by Coxey and his followers in their to-be-hoped-for successful tramp to Washington! In these days of close competition and needful conservatism, the amount of "waste energy" needs to be reduced to the minimum in business ventures to achieve success. Steam pipes have to be felted, radiators have to be selected with all efficient surface. Such radiators are the Bundy Climax, Bundy Perfect, Bundy Newport, and Bundy Pin indirect. They are all made up of a larger percentage of plain surface than any other indirect radiator on the market. To be sure they have some extended surface; which is necessary to cut up, divide, and sub-divide the air in passing.

The Bundy Perfect indirect radiator is made 36, 29, 23, and 19 inches long. All Bundy indirect radiators are end-connected, a central connection developing too much "waste energy" in forcing the air around the impediment made by the connection in the center right in the way. Then, again, to get at the center connection for repairs or otherwise is a difficult matter.

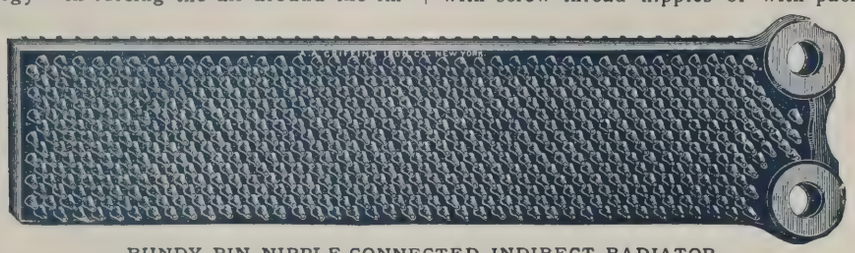


BUNDY CLIMAX INDIRECT RADIATOR.

All the Bundy indirect radiators are connected with screw thread nipples, excepting the Bundy Pin, which is furnished both ways, with screw thread nipples or with packed joints. Some people want low cost goods and won't pay the extra cost of a nipple. For them the packed joint Bundy Pin is made, but those desiring the best are furnished with a nipple connected radiator every time. The Bundy Newport radiator is the Bundy Climax with an additional barrel or lobe, having three barrels, while the Climax has but two. The Newport is especially designed for hot water heating, but is equally desirable for steam. It makes a stack 15 inches high, and is much cheaper to use than two stacks, one arranged above the other in a bank, using sections of less depth. The air in passing through expands and equalizes between the bottom and central barrel of each section, and then again between the center and top barrels, and as a result a higher temperature is secured and maintained



BUNDY PERFECT INDIRECT RADIATOR, 36 INCHES LONG.



BUNDY PIN NIPPLE-CONNECTED INDIRECT RADIATOR.

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RADIATOR MANUFACTURERS,

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BOSTON UNIVERSITY,
C. C. MITCHELL, Supt. of Buildings,
220 Devonshire St., Boston, Mass., Dec. 27, 1893.

MESSRS. HODGE BROTHERS, Boston, Mass.

Gentlemen: In reply to your inquiry under date of December 27, as to whether the Eureka Air Valves purchased of you were giving satisfaction or not, I will say, I can with great pleasure to myself reply in the affirmative. We have now some over One Hundred and Fifty of your valves in use and have yet to rec ive the first complaint that they are not doing their work perfectly. Steam users certainly cannot afford to be without them, and one trial will convince the most skeptical that the Eureka is "THE" valve above all others.

Respectfully yours,
C. C. MITCHELL,
Boston University,
Supt. of Buildings.

Pat'd Aug. 2, 1892.



External view of No. 5.

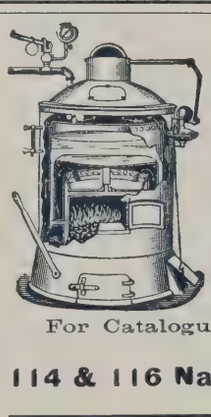
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THE NEW
"PEERLESS"
Steam and Hot Water Heater.
The Simplest Cheapest and Best.

A testimonial:

JOHN WANAMAKER, MECHANICAL DEPARTMENT,
PHILADELPHIA, PA.

DEAR SIR: In answer to yours in relation to the "Peerless" boiler in swimming pool at Chelton Hills would say the boiler has given us good satisfaction and heats the water well. As near as I can remember the pool is 14 feet wide, 58 feet long, 7 feet deep at one end and 4 feet at the other. We can raise the temperature of the water to 75 degrees in four hours. Yours truly,
JOHN WANAMAKER.

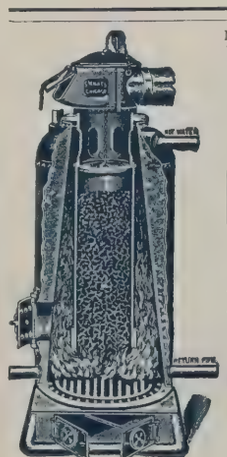


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Thermostat Cabinet.

THERMOSTAT

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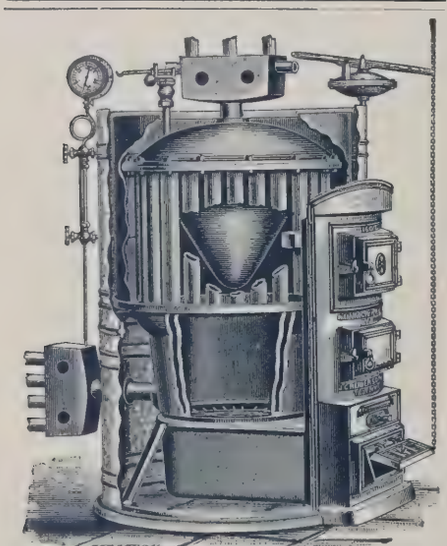
will absolutely control the draft and pressure of steam from the temperature of the room.

We regulate the pressure according to the amount of heat desired without any changing of weights for mild or extreme cold weather, can open and close your dampers at variation of ¼ pound pressure, and open and close the dampers at variation of one degree of temperature—a thing that no other regulator made can do. It is **Strong, Durable, Simple, Perfect, Efficient and cheap.**

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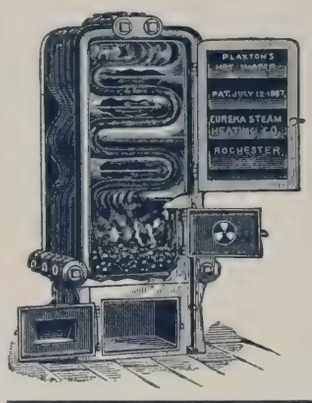
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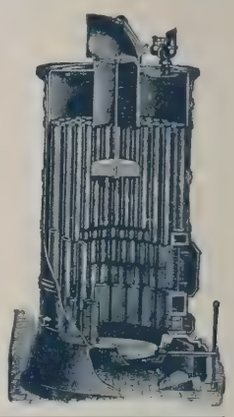
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goes with every one of our Heaters. It's in the fire-box of every boiler. You can't see it, may be, but it's there. The man who uses the boiler will find it.



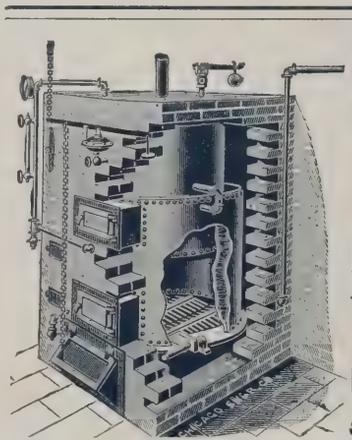
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The construction is such that the greatest possible boiler surface is exposed to the direct radiation of the fire. The drop tube system is used and the ratio of fire surface to grate area is nearly 40 to 1. These boilers are both easily and quickly set up—more so than any others. That is a feature worth considering. We'd like to send you our book.

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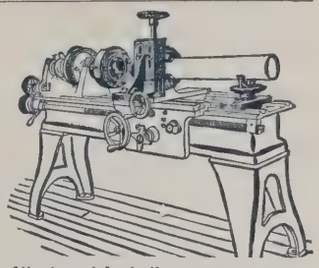


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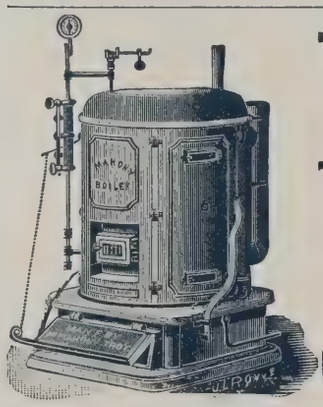
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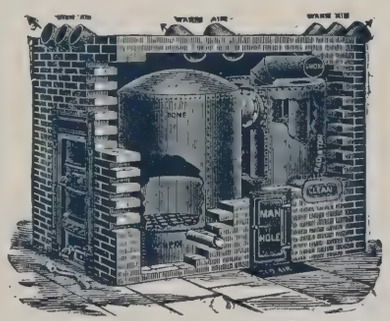
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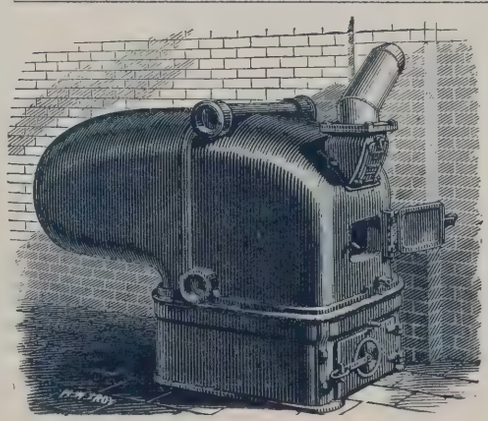
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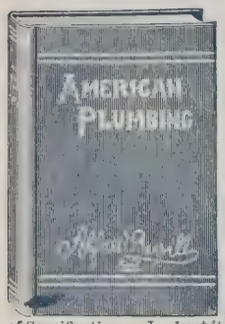
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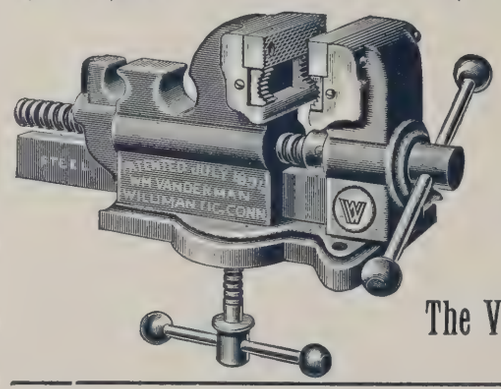
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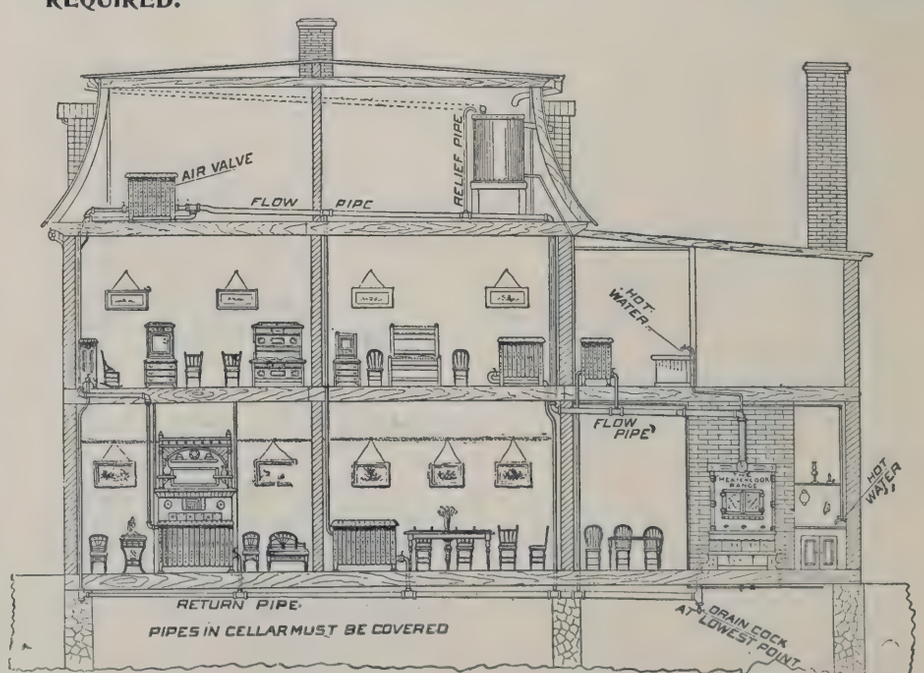
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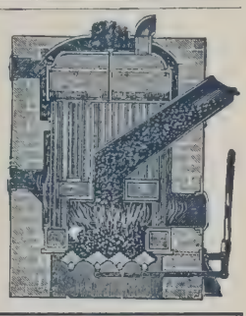
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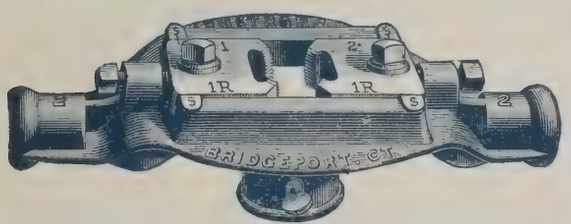


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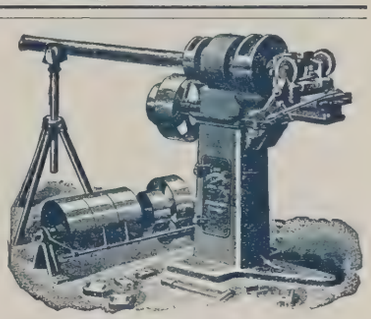
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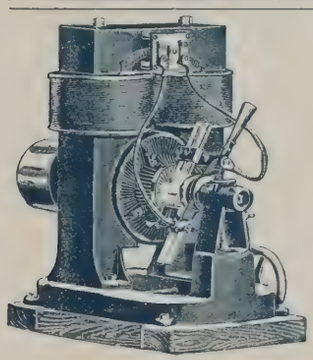
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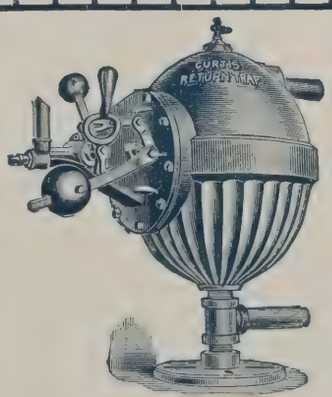
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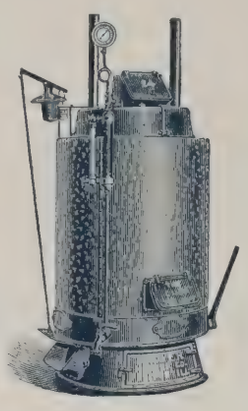
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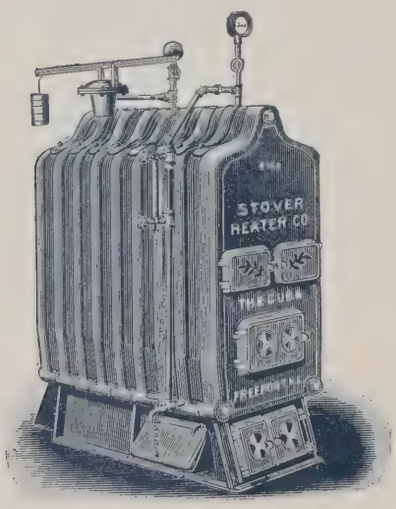
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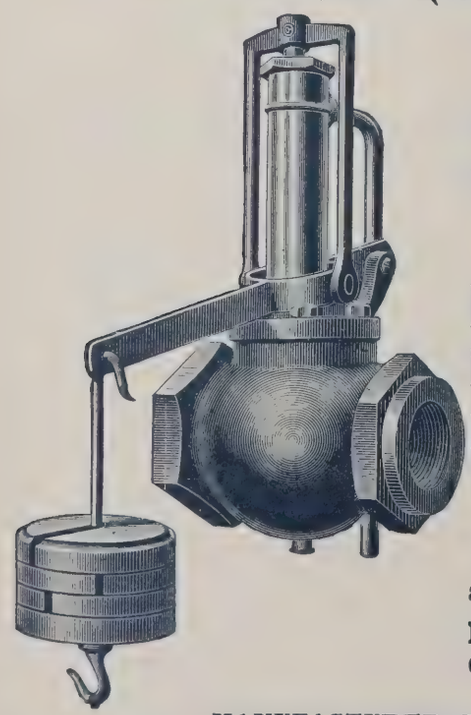


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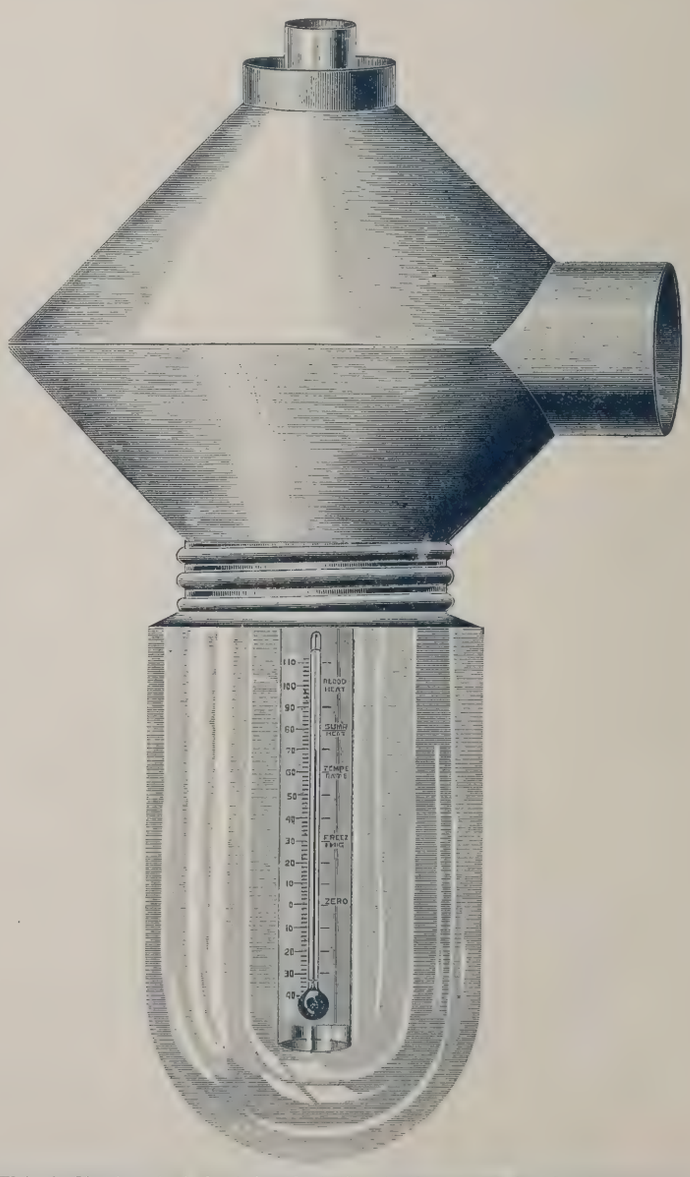
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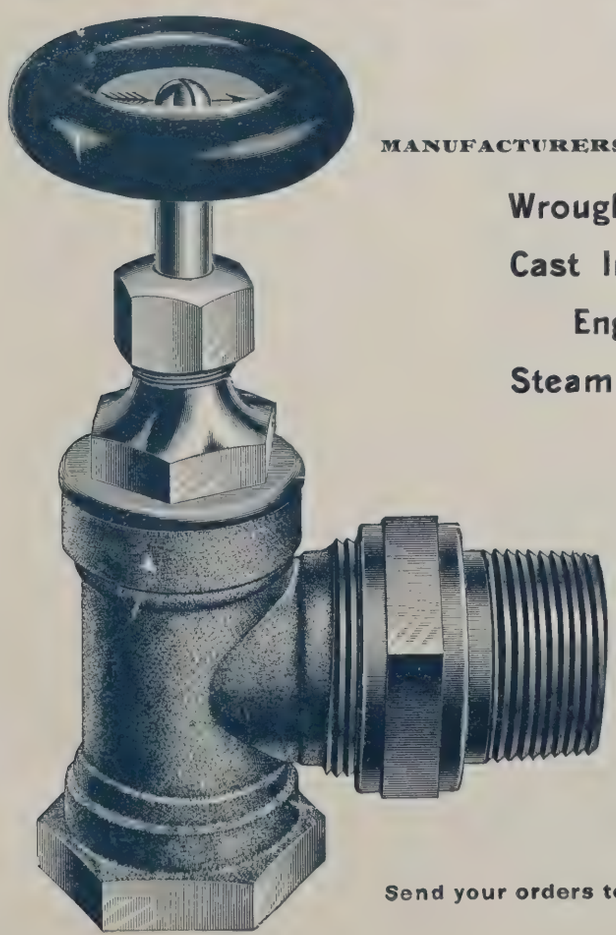
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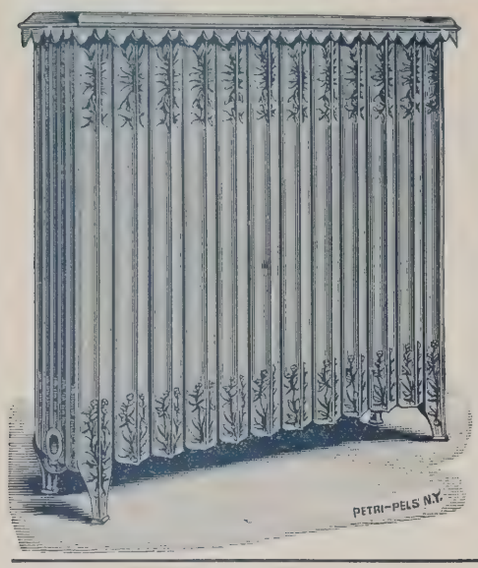
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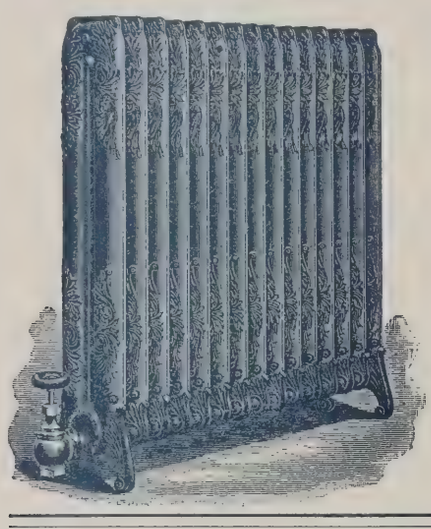
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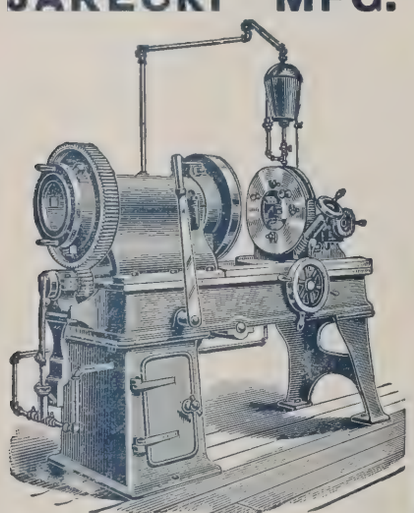
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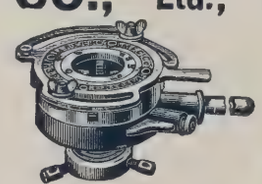
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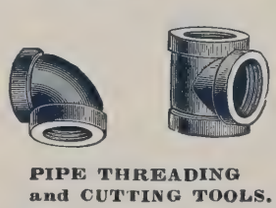
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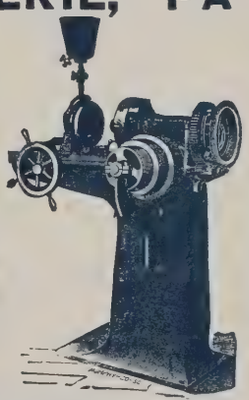
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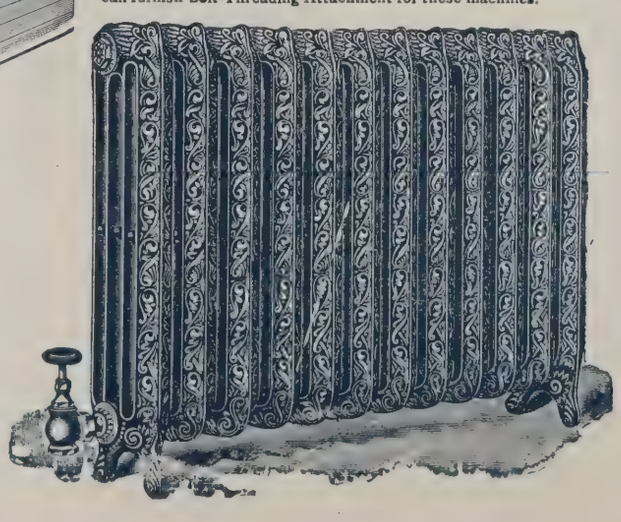
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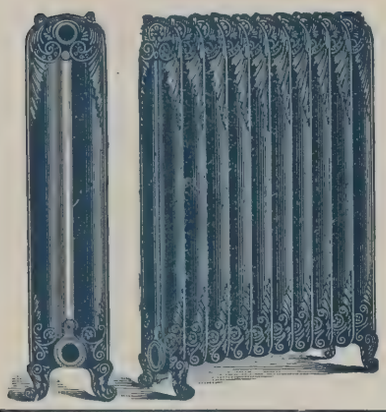
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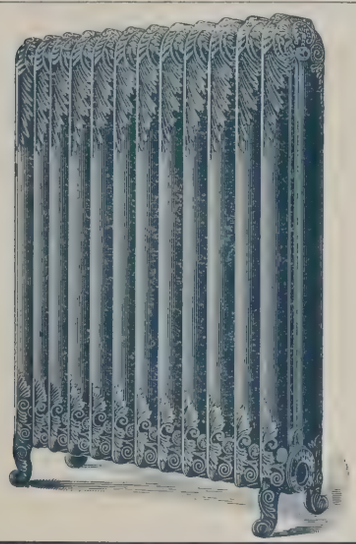
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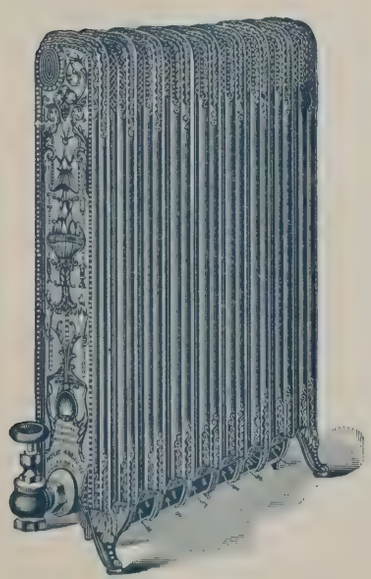
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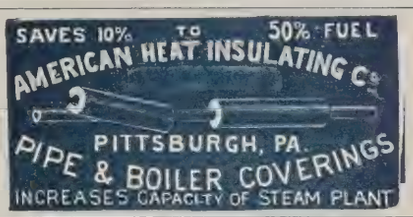
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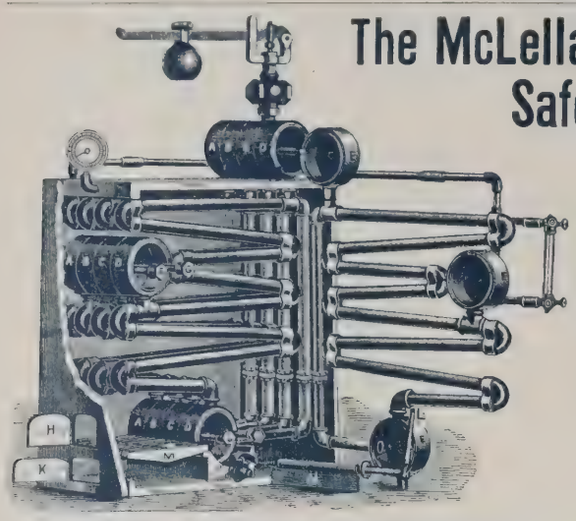
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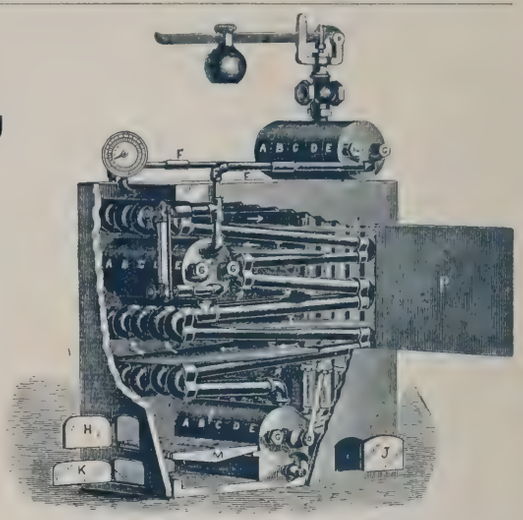
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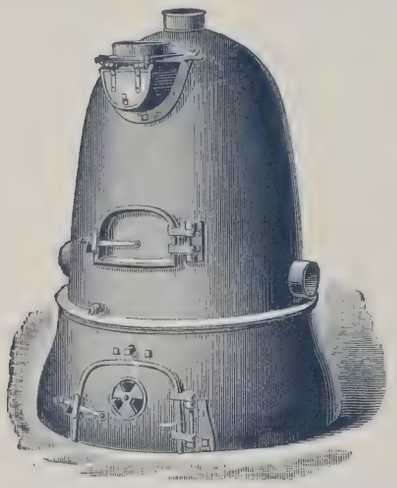
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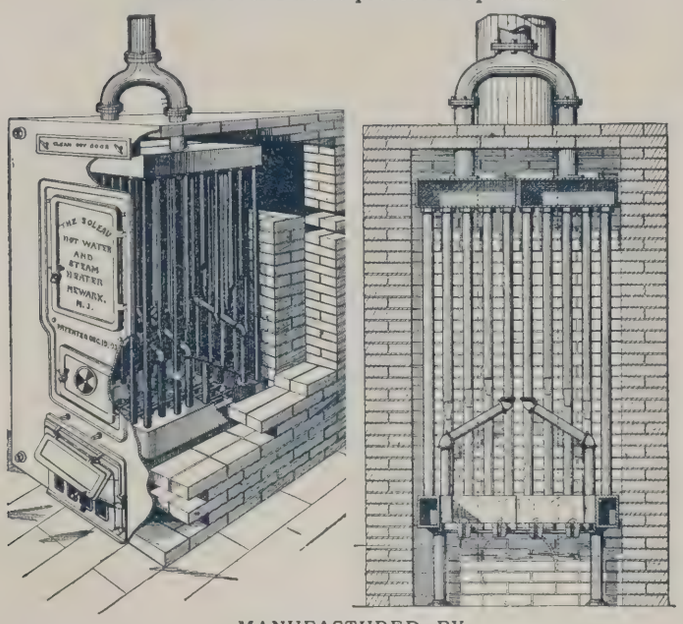
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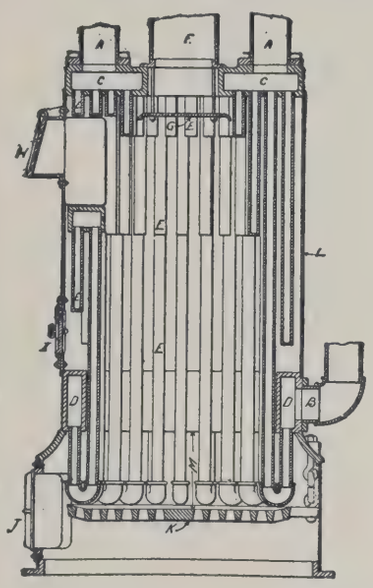
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The best and most economical system of HOT WATER HEATING in the market.

SUPERIOR ADVANTAGES.

Largest heating surface in close contact with fire.
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Perfect combustion of and greatest economy in fuel.
Requires least attention.
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With our half-inch wrought iron pipe radiation, will respond to fire as readily as a stove.



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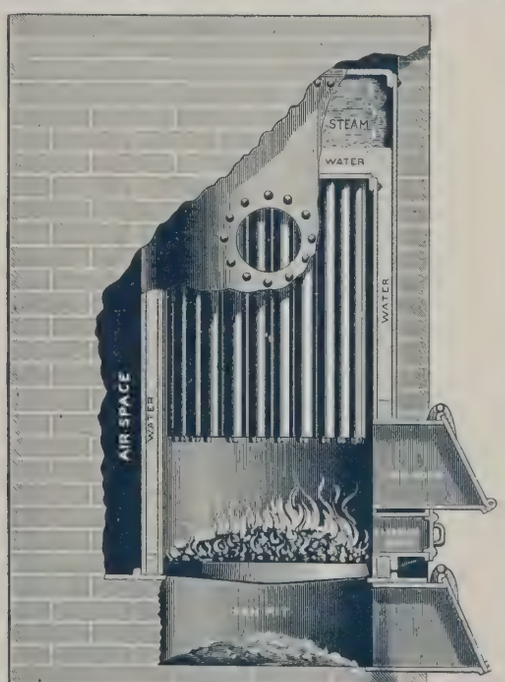
A—Flow.
B—Return.
C—Upper Water Ring.
D—Lower Water Ring.
E—Drop Tubes.
F—Smoke Flues.
G—Baffle Plate.
H—Feed Door.
I—Clean-out Door.
J—Draft Door.
K—Grate.
L—Jacket.
M—Vertical Grate Surface.

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THE REMINGTON WROT IRON STEAM HEATER.



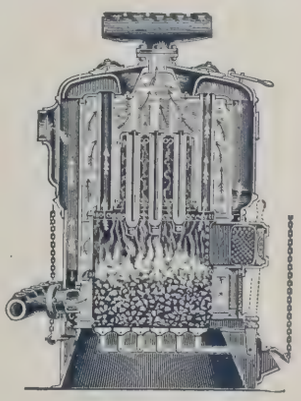
For ECONOMY OF FUEL, ABSOLUTE SAFETY, GREAT DURABILITY, SIMPLICITY AND EASE OF MANAGEMENT,
The Remington Wrot Iron Steam Heater
CANNOT BE EXCELLED.

Built only by

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WILMINGTON, DEL.

AT THE HEAD TO STAY.

There are good points in all—all there are good in all, and many there are in none others, are harmoniously combined in

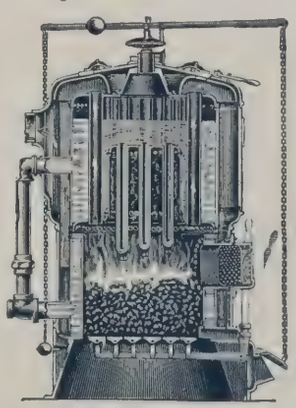


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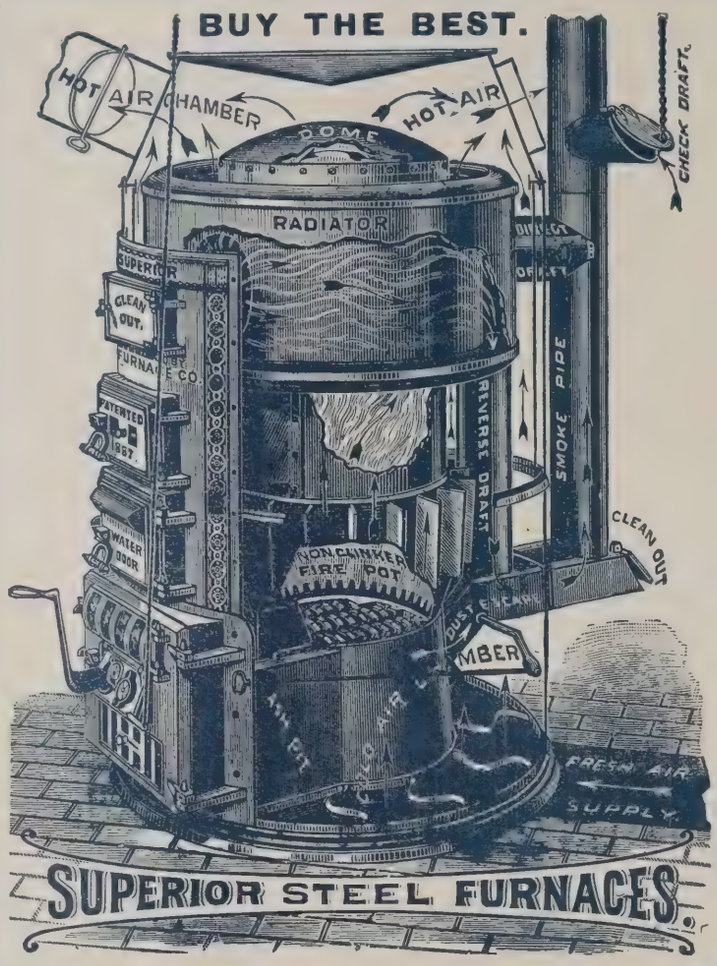


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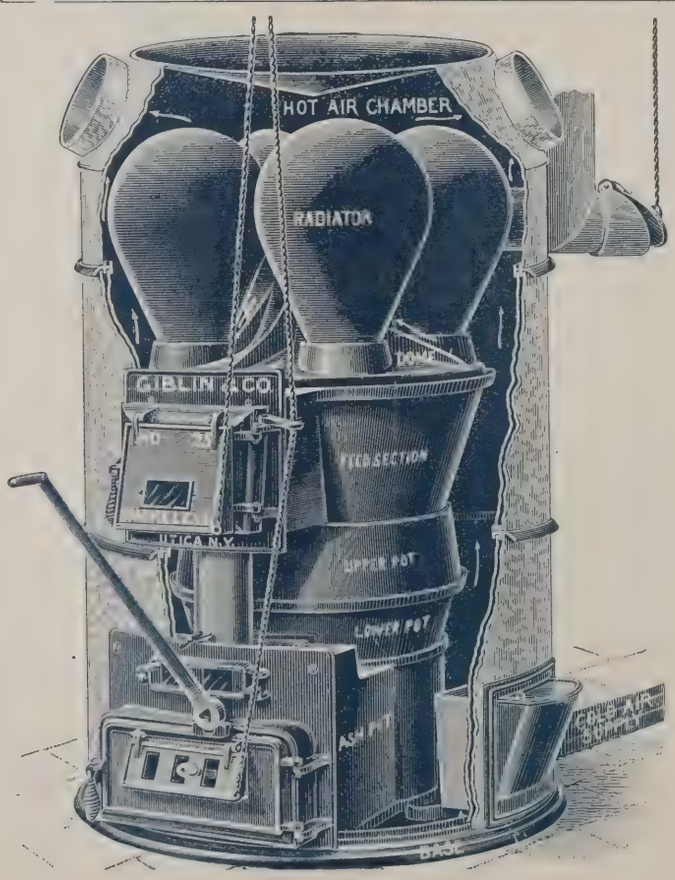
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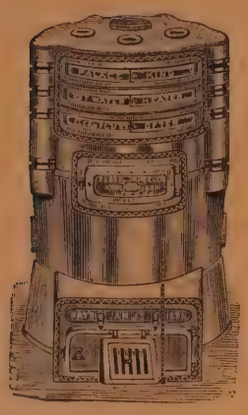
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We want Live, Practical Furnace Men to sell this furnace in every place where Agents are not already established.

Apply promptly for descriptive Catalogues, Prices and Discounts.

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PALACE KING
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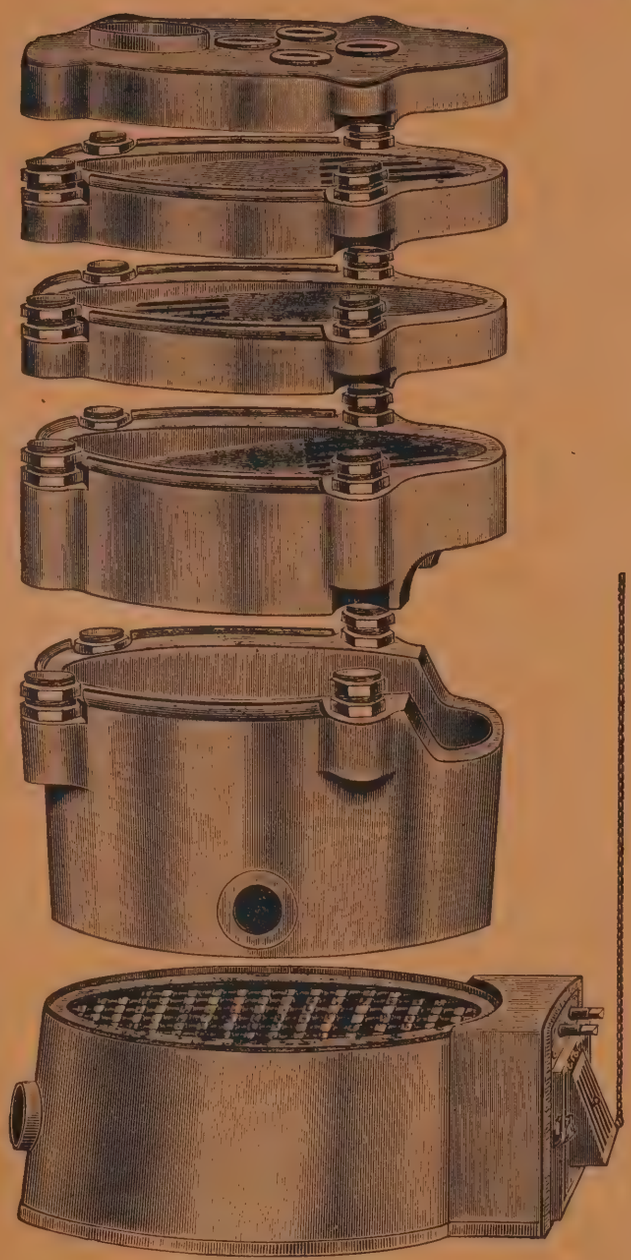
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We use . . .
No Packing,
No Long or Short
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Our Nipple Connection allows the sections to lie close together.

There is no excess of flue surface.



Circulation . .
Quick
and
Inclined.

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Positive.

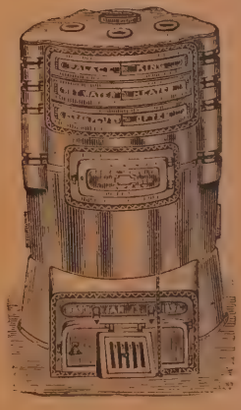
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Perfect
and
Tight
under all conditions.



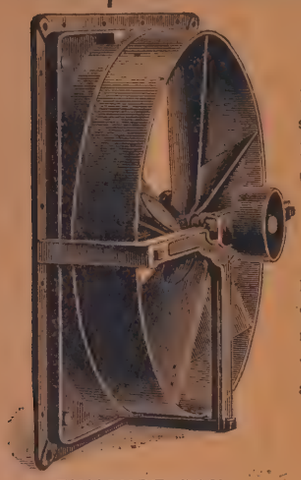
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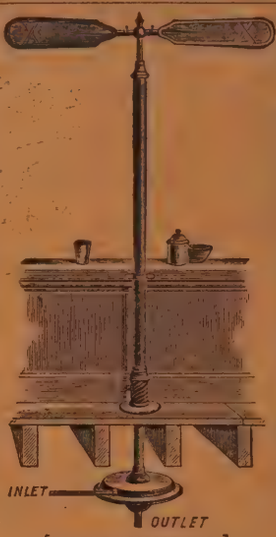


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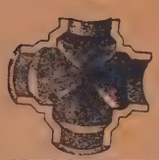
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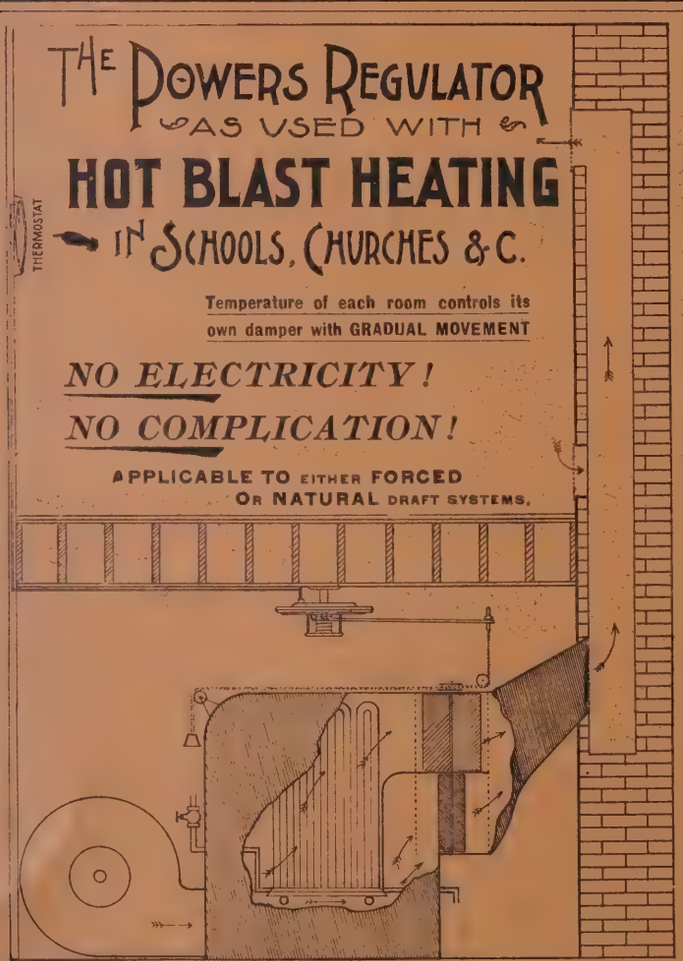




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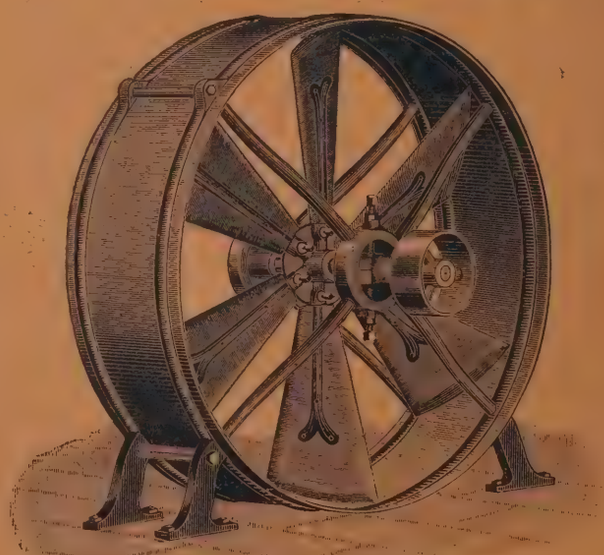
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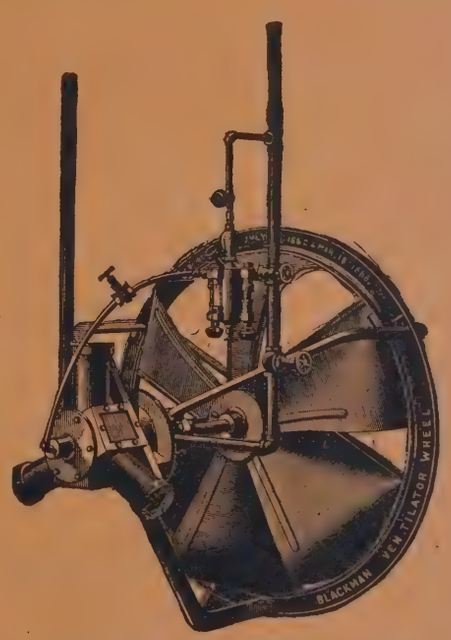
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SUCCESSFUL SANITARY VENTILATION
Can now be Accomplished.



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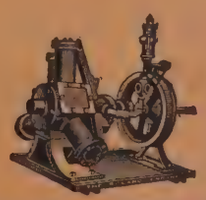
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The Blackman. (Diagonal View.)



The Blackman. (Back View.)



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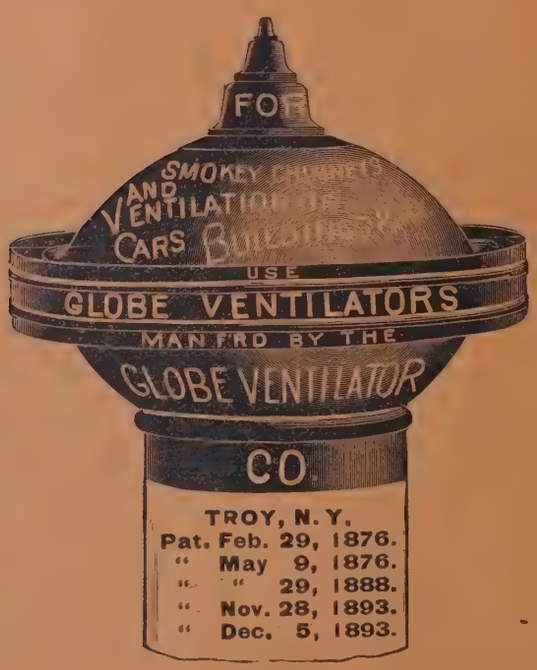
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STEAM VALVE WHEEL.

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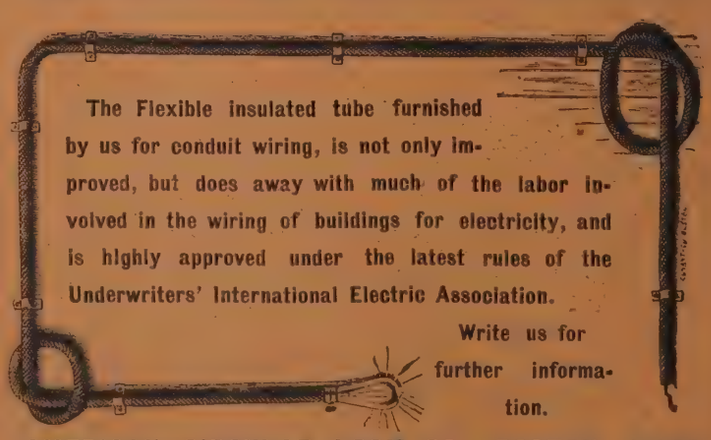


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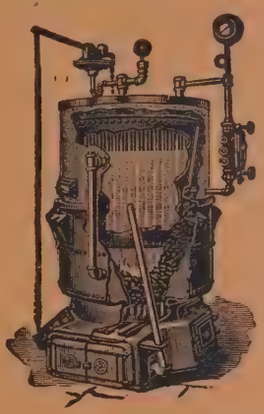
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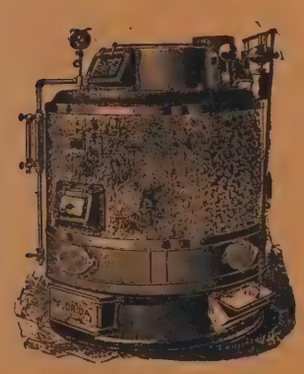


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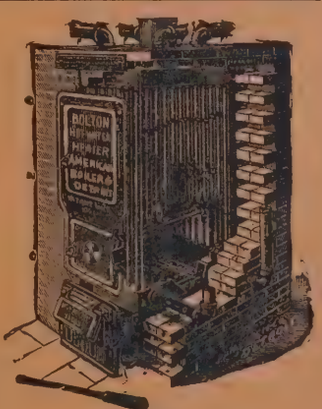
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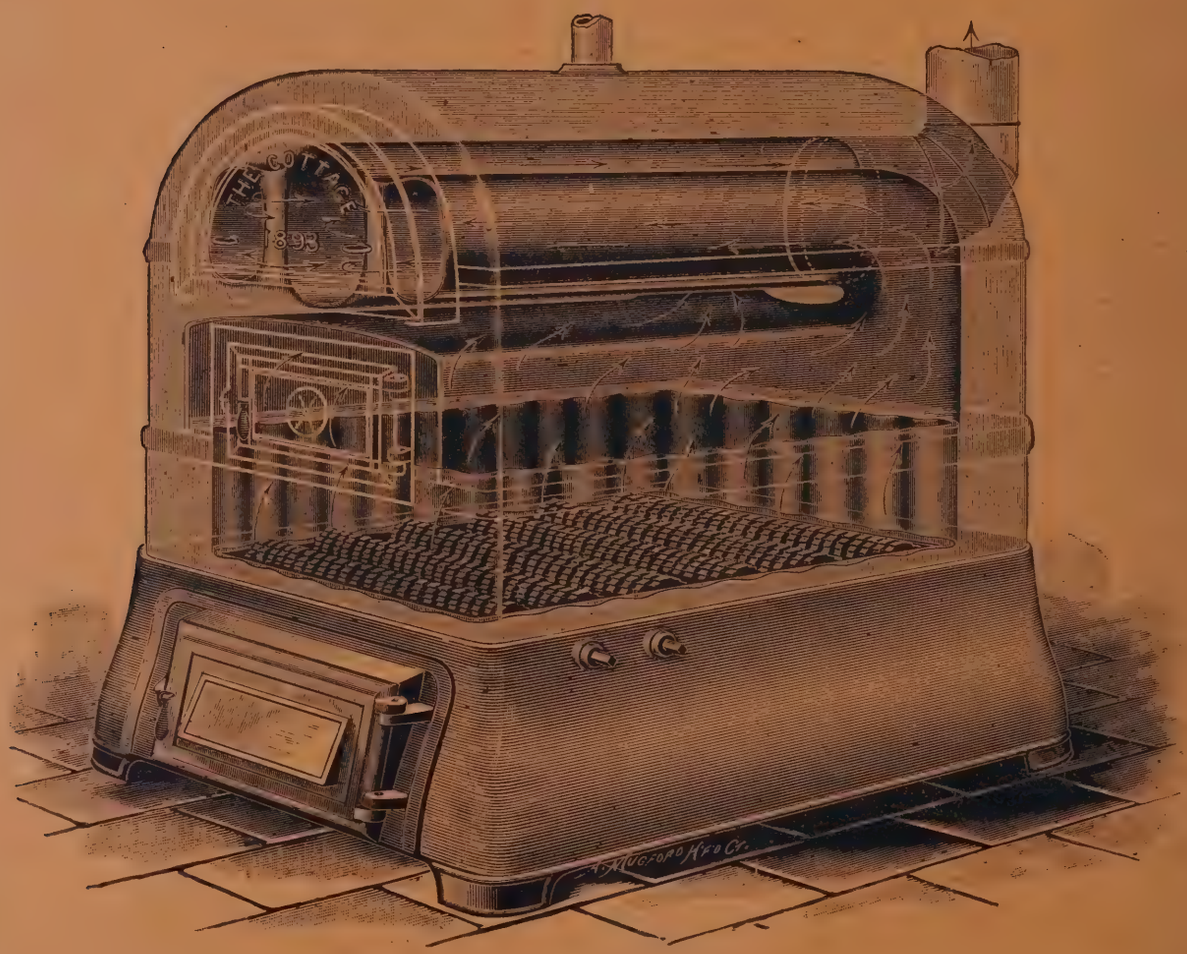
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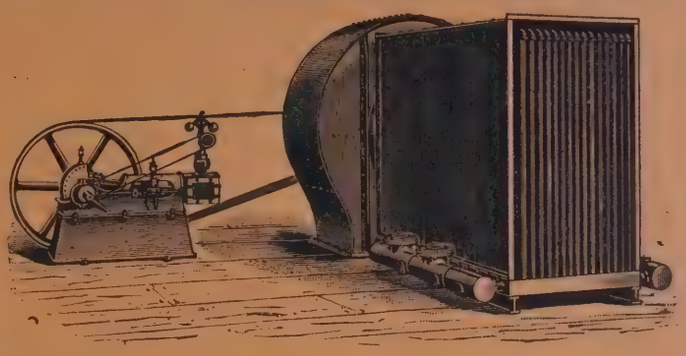
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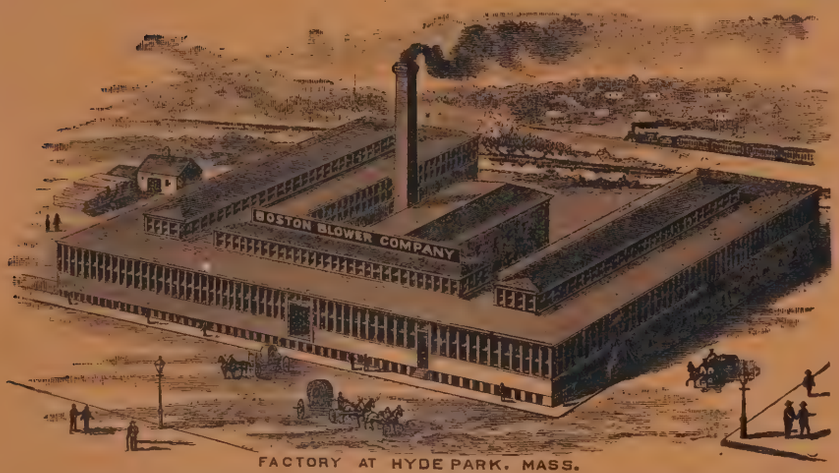
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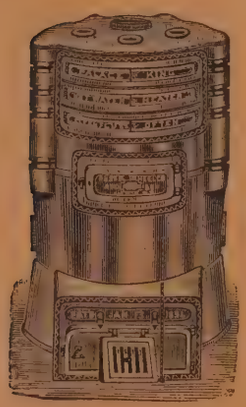
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PALACE KING
HOT WATER BOILER
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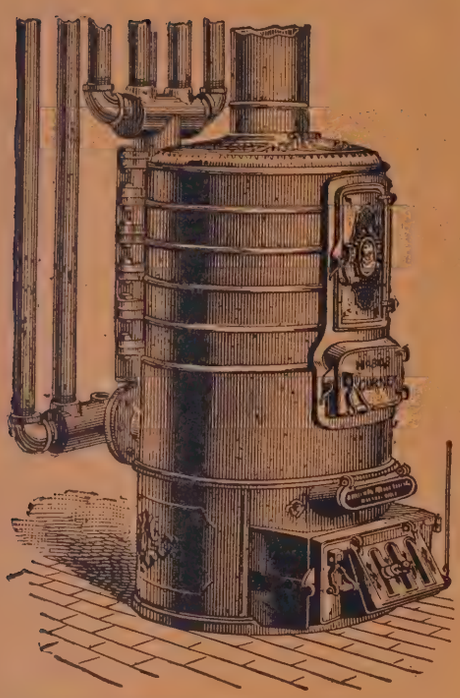
We use No Packing, No Long or Short Bolts.
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There is no excess of flue surface.
Circulation Quick and Inclined.
Boiler Surface Horizontal and Positive.
Joints Perfect and Tight under all conditions.

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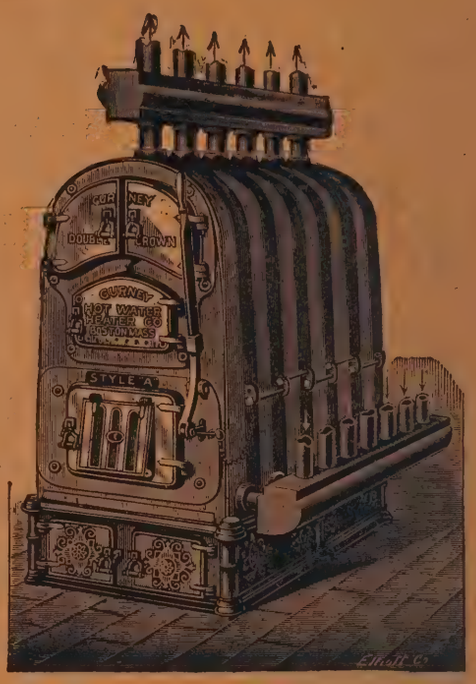
GURNEY



300 Series Hot Water Heater for Hard or Soft Coal.
Capacities 275 to 1,850 square feet.

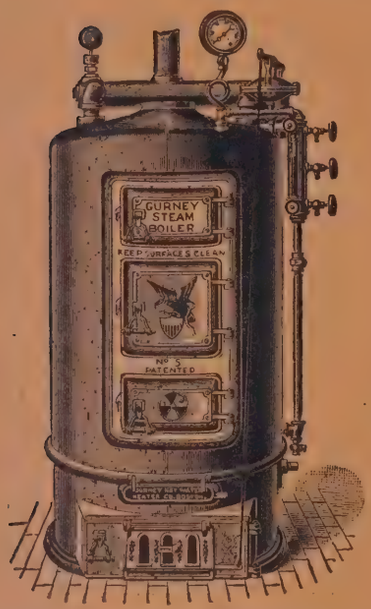
Hot Water Heaters, Steam Boilers AND Radiators.

1894.



Double Crown Hot Water Heater, made in 3 styles—A, B or C.
Capacities from 750 to 6,000 square feet.

ALWAYS LEADING BY THEIR MANY MERITS.

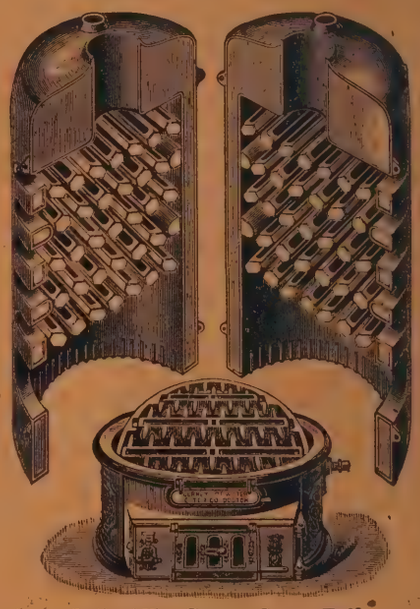


Perspective View **Gurney Steam Boiler.**

What W. J. Baldwin, M. E., the Heating Expert and Engineer of New York, says:

"The performance of the Boiler during the trial was admirable, being steady and reliable so that the steam did not vary ½ pound in pressure at time of firing;" and he further states: "I never tested a boiler which gave as high an efficiency of evaporation per square foot of average boiler surface."

Capacities from 350 to 1,300 square feet, direct radiation.



Sectional View **Gurney Steam Boiler.**

EMBODY ALL APPROVED FEATURES OF MODERN SCIENCE.



"GURNEY" Radiator for Hot Water.

WE INVITE CORRESPONDENCE.
Send for Trade Catalogue.

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163 FRANKLIN STREET,

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J. C. F. TRACHSEL,
246 Arch Street, PHILADELPHIA, PA.

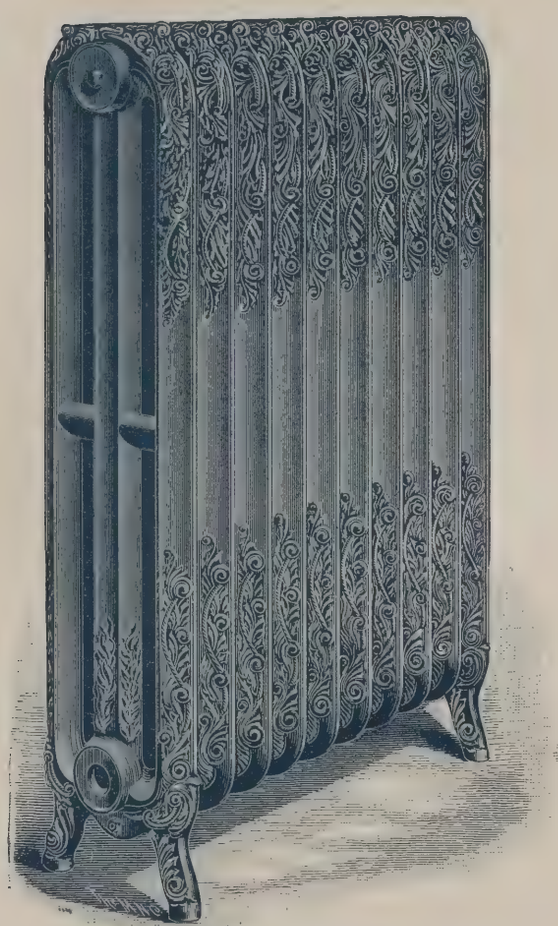


YALE" Radiator for Hot Water or Steam.

The "New" Standard Radiators

STEAM OR WATER.

EXCELLENCE OF ART IN CASTINGS.



"NEW" STANDARD RADIATOR.
(Regular Loop.)

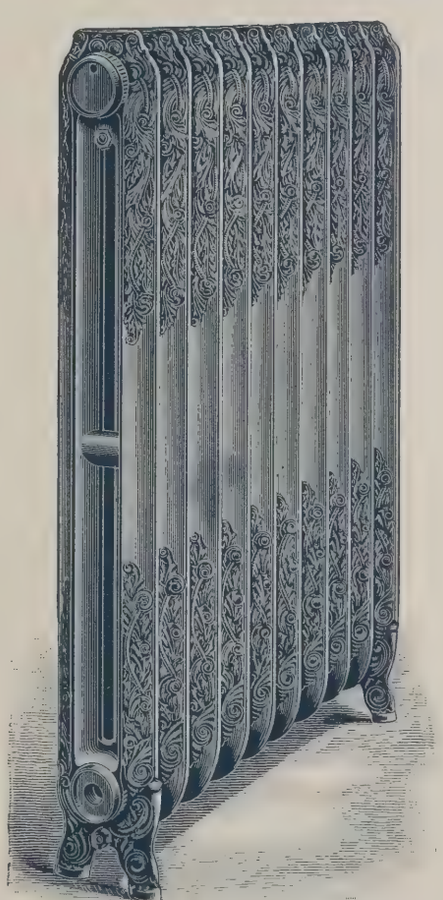
In Standard loop as shown in cut, containing five sq. ft. to the section.

In single loop 5 1/2 in. wide, containing three sq. ft. to the section.

In four column (extra wide), containing seven sq. ft. to the section.

HEIGHTS.

44 IN. HIGH,
38 IN. HIGH,
32 IN. HIGH,
26 IN. HIGH,
22 IN. HIGH,
18 IN. HIGH.



"NEW" STANDARD RADIATOR.
Single Loop. $5\frac{1}{2}$ inches wide.

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J. H. CUNNINGHAM CO., Managers.

CHICAGO OFFICE, 167 & 169 LAKE ST.
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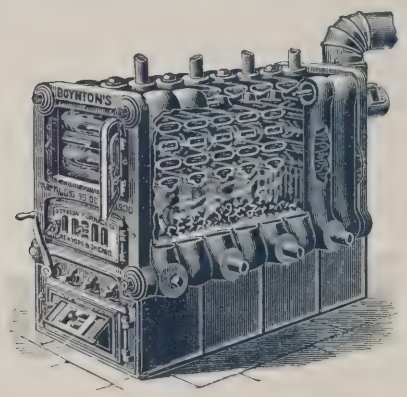
The Standard Radiator Company,

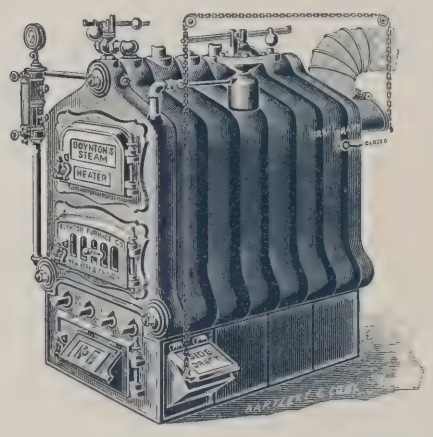
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ESTABLISHED 1849. GOODS UP TO THE TIMES. INCORPORATED 1884.

THE BOYNTON FURNACE CO.

Are the only manufacturers of the Genuine and Latest Improved





BOYNTON HOT WATER HEATERS
STEAM HEATERS
FURNACES
RANGES, ETC.

and all goods bearing that name fully warranted.

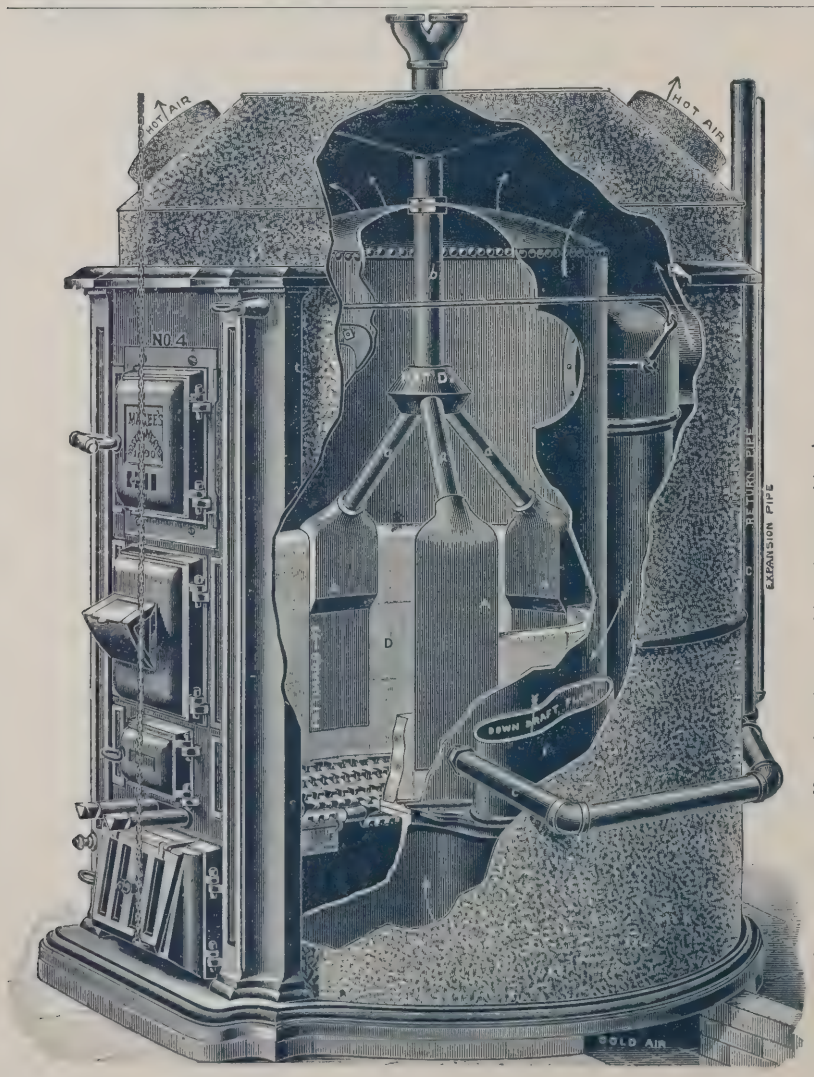
Make Sure that BOYNTON FURNACE CO. are the manufacturers of the heating apparatus you purchase. They are for sale by the best dealers all over the United States. Our catalogue free. Better send for it, indicating the style of heating desired.

THE BOYNTON FURNACE CO.

195 & 197 Lake St. CHICAGO.

207 & 209 Water St. NEW YORK.

NOTE.—The Boynton Furnace Co. manufacture Steam and Hot Water Heaters and Furnaces of special construction which are guaranteed to operate successfully with soft coal for fuel.



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MAGEE FURNACE CO.

is one of the oldest makers of

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in the country. We have used combined *hot water* and *warm air* in heating for more than *25 years*. Our present system is the result of long experience, and is as near perfection in every particular as it is possible to attain.

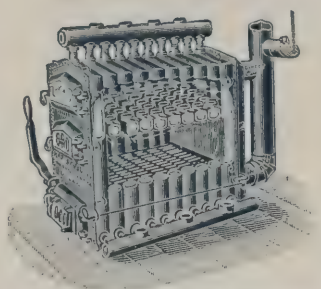
Let us send you some of the letters we have received from enthusiastic users. It will pay *YOU* to control the sale of the *MAGEE* line in your town.

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242 WATER STREET, NEW YORK.

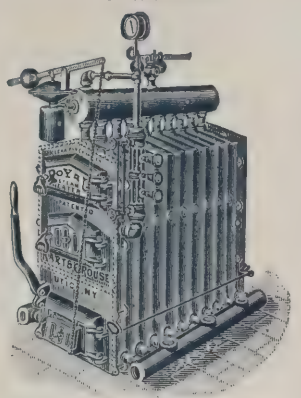
86 LAKE STREET, CHICAGO, ILL.



Royal Hot Water Heater, Sectional. All Vertical Circulation.

Sold on their Merits, Not on their Antiquity.

ON THE UP GRADE.



Royal Steam Heater. Will keep a steady Water Line.



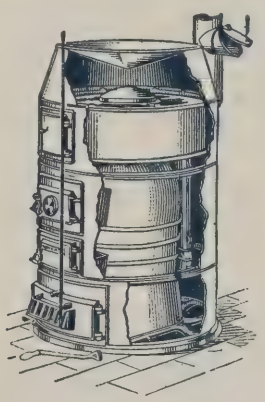
Imperial Hot Air Furnace, Best Cheap Furnace made.

MOST COMPLETE LINE ON THE MARKET.

TRADE
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YOU
WANT YOUR SHARE OF IT.

WRITE US
AND LET OUR SALESMAN CALL ON YOU.



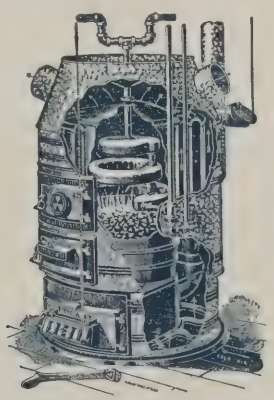
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Don't Delay Investigating These Heaters Before The Season Begins.

Styles, Sizes, And Prices To Suit All Classes Of Trade.

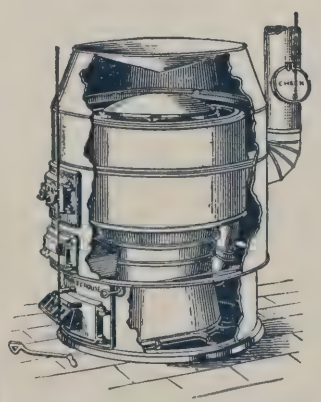
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Royal Hot Water Heaters.
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Royal Combination Heaters.



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Prince Royal Hot Air Furnace Radiator No. 14, Gauge Steel. A Furnace of Great Merit.

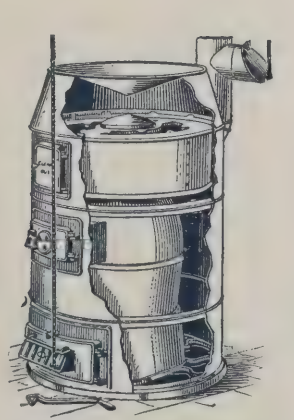
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CHICAGO, 79 Lake Street.

ROYAL HEATERS

W. M. Mackay, Manager Hot Water and Steam Department, 211 Water St., New York.



Royal Victor Hot Air Furnace, Wrought Iron Radiator, Medium Price, Excellent Heater.

Regulate The Temperature!

NOT OF THE WEATHER, BUT OF YOUR HOME OR OFFICE.

Overheating and a Sudden Change in Temperature IS BAD!
A Uniform and Even Temperature IS GOOD!
When it is Done Automatically and Economically it IS BETTER.

THE HOME CIRCLE is made HAPPY and HEALTHY when no draught or chilly blast from an open window disturbs your wife, your children, or yourself.
THE SCHOOL ROOM is made PLEASANT and HEALTHFUL, instead of being close and disagreeable.
THE ART ROOM is made a SAFE PLACE for all articles that are *easily ruined by irregularity in the Heat Supply.*
THE OFFICE is made COZY and COMFORTABLE instead of being either a sweat-box or a refrigerator.

QUESTION: WHAT WILL ACCOMPLISH ALL THIS?
ANSWER: THE JOHNSON SYSTEM OF AUTOMATIC HEAT REGULATION.

ELECTRICITY,—THE SILENT POWER! It is a part of the **JOHNSON SYSTEM OF HEAT REGULATION,** and is made to perform untiring service in the regulation of temperature, either by direct or indirect radiation, by hot water or hot air, and secure to you all the advantages arising from a temperature that does not fluctuate.

SPECIAL ARRANGEMENT for the regulation of the hot water supply, thus preventing damage to plumbing, bath tubs, etc. Send for Descriptive Catalogue.

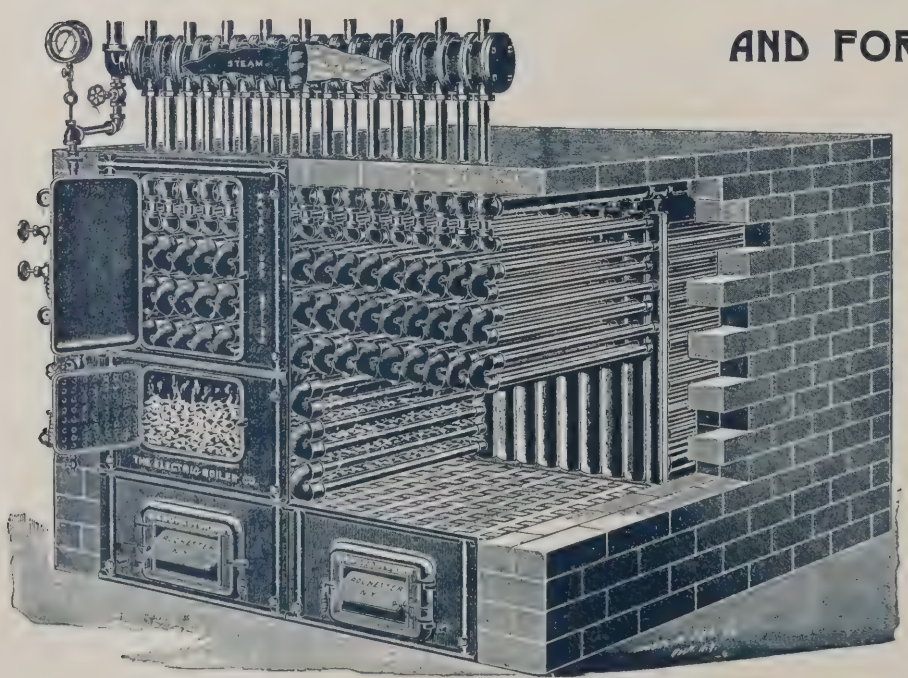
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THE ELECTRIC BOILER

FOR

STEAM AND HOT WATER HEATING



AND FOR STEAM POWER.

MANUFACTURED
IN OVER
300 Different Sizes.

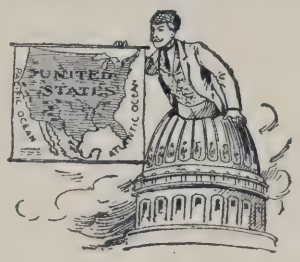
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NEW YORK OFFICE, 44 DEY STREET.

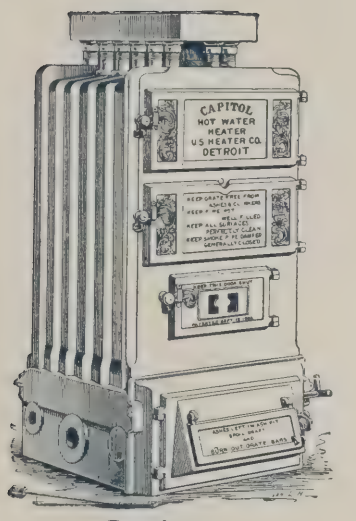






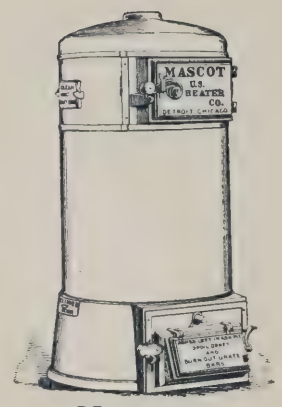
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Hot Water. Steam.

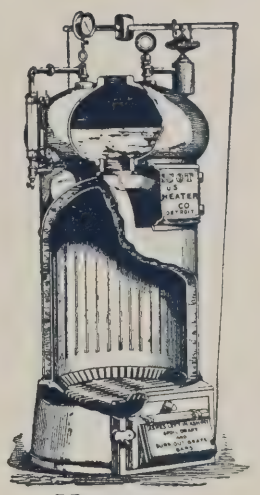


Capitol.

CAPACITIES,
275 to 4,400 feet of Radiation.

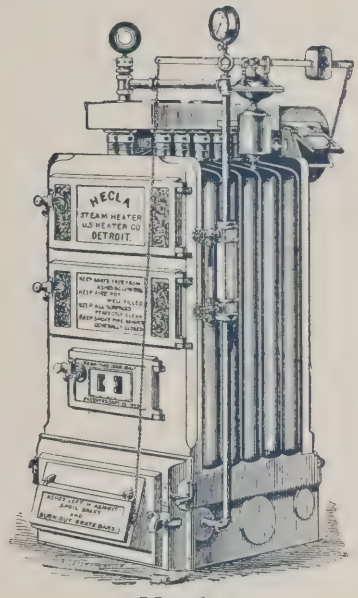


Mascot.



Mascot.

CAPACITIES,
175 to 2,700 feet of Radiation.



Hecla.

Do you remember our points of construction?

Lateral Draft, striking all surfaces squarely and repeatedly.
Vertical Circulation, uniformly upward from base to top.
Few joints, all metal, easily and quickly made.
One grate bar for each section.
Each half section independent of rest of heater.
Every inch easily cleaned by brush. No flue holes.
Shipped in sections, easily handled and quickly set up.
Lightest, smoothest and strongest castings ever put into a heater.

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We have never taken a contract or employed a fitter, but do all our business through the trade.

Do you handle our goods?

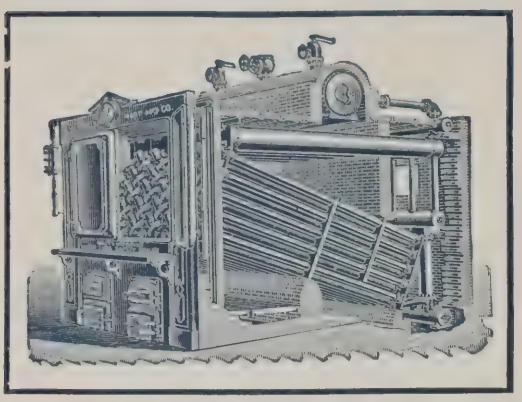
We shall be at the Convention. COME AND TALK TO US.

UNITED STATES HEATER COMPANY,

115 Randolph St., DETROIT.

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THE ROOT IMPROVED WATER TUBE BOILER



Rapid Steam Generators for Heating

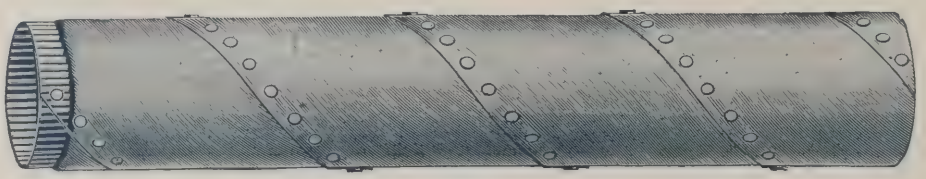
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HIGHEST POSSIBLE ECONOMY WITH ABSOLUTE SAFETY.

SPIRAL RIVETED PIPE.

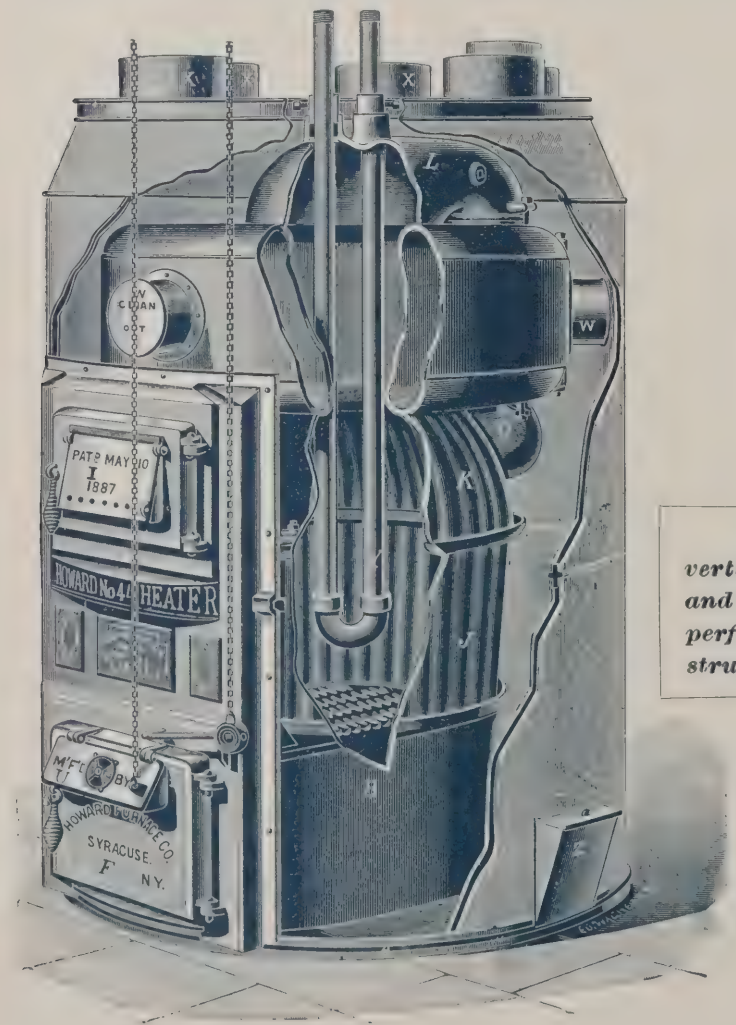
3 to 24 inches in Diameter.



2 to 25 feet Lengths.

For Ventilation, House Leaders, Exhaust Steam, Water Supply, etc.

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Send for Catalogue.



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COMBINATION

HEATER.

THE HEATING OF WATER IN A SEPARATE VERTICAL TUBE IS A SOURCE OF POWER.

By placing all the heating and absorbing surface vertically the water is presented in a column to the fire, and in the most favorable condition to be heated, allowing perfect freedom for the water to ascend upward, unobstructed by any CROSS CURRENTS.

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HOWARD FURNACE CO.

SOLD AT

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THE CELEBRATED . . . .

"Thatcher"

Furnace and Ranges.

GAS-TIGHT.
DURABLE.
ECONOMICAL.

Also Manufacturers of the

"Champion"

Steam and Hot-Water Heaters.

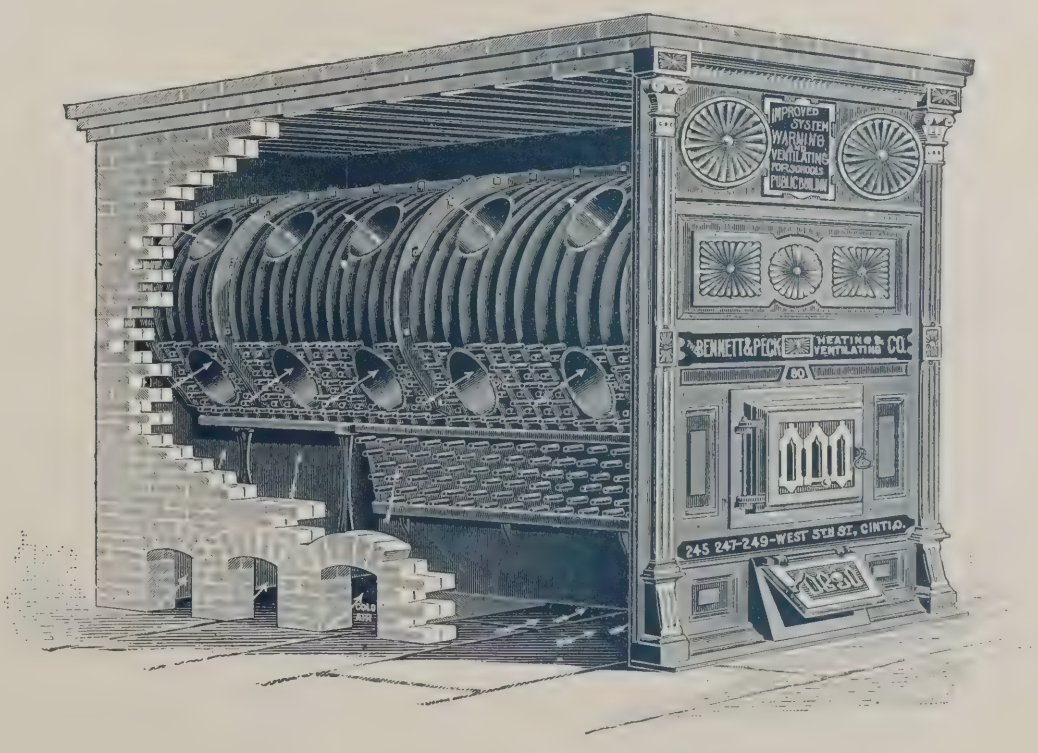
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Specified by Leading Architects.

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240 Water Street, New York.

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and
Private
Institutions,



All use some one of our various Heating Systems. Why? Because they are best and invariably give satisfaction. Dealers should write us.

THE
Bennett & Peck Heating & Ventilating Co.
CINCINNATI, OHIO.

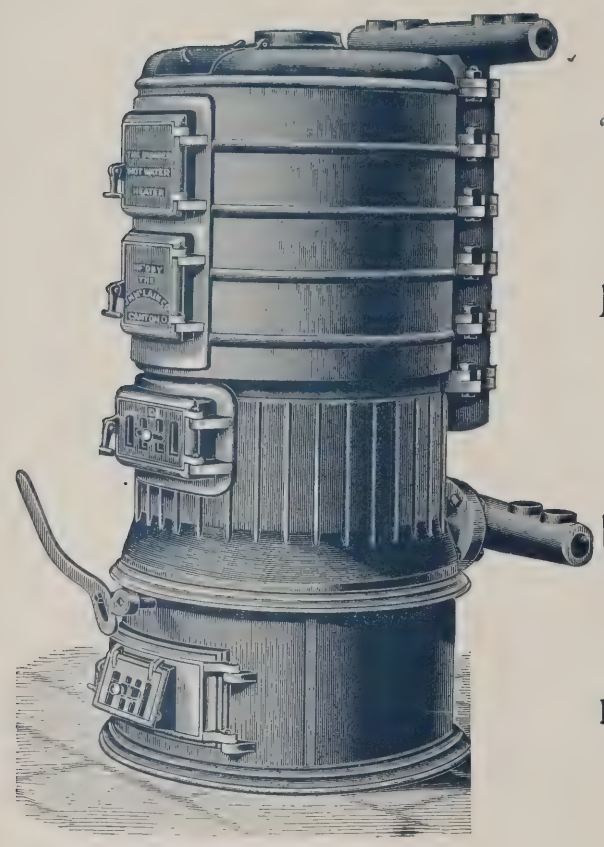
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"CANTON HEATERS."

— FOR —

Hot Water, Steam, and Hot Air.

"HUMBER," "YALE," "CAMBRIDGE," "OXFORD PERFECT
"HARVARD," "TUBULAR," BLAST."
"SANDOW,"



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Plenty of Sizes. For all Kinds of Fuel.

A Good Line to Handle. Send for Catalogue.

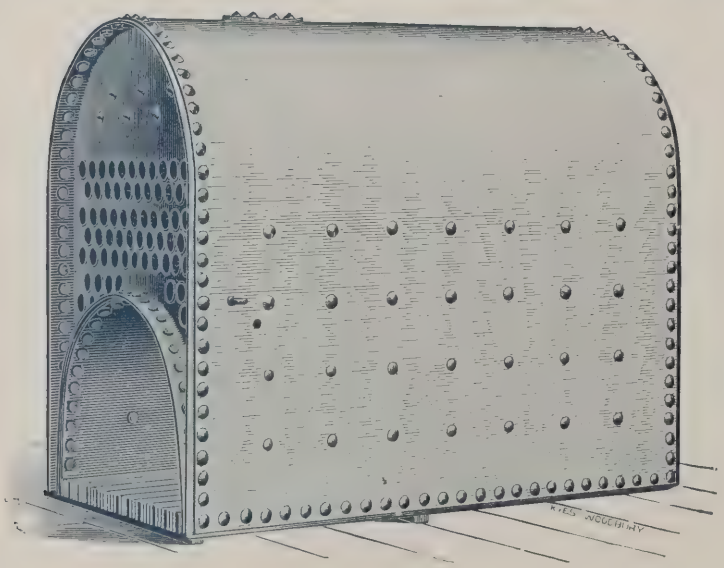
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FOR SIX YEARS

THE LEADING BOILER

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FINE RESIDENCES AND PUBLIC BUILDINGS.

STRONG, DURABLE AND ECONOMICAL

IN USE OF FUEL.

Built for Low Pressure Steam,
High Pressure Heating and
Hot Water.

WM. ALLEN & SONS, WORCESTER, MASS.

OUR

NEW SECTIONAL

"SUNRAY"

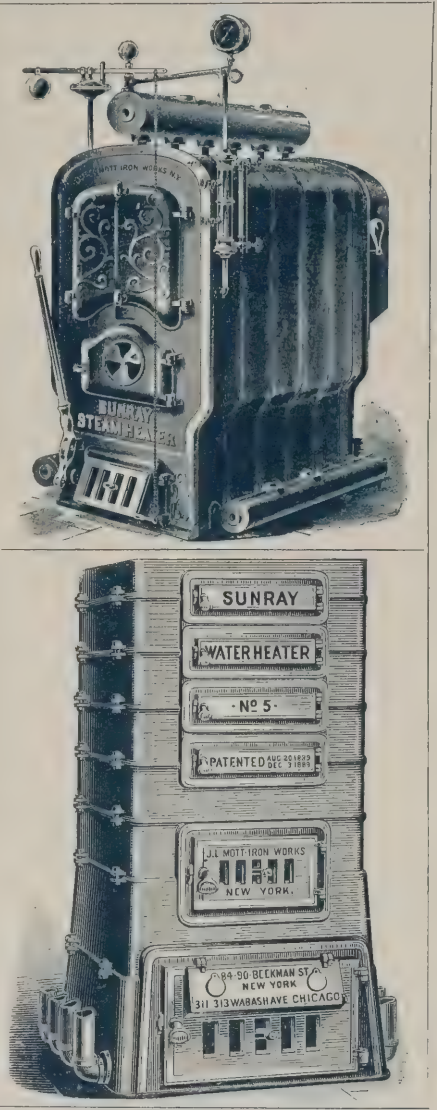
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Made to carry from 450 to 2400 feet of Steam Radiation.

HAS MORE TALKING POINTS THAN ANY OTHER BOILER.

It is the easiest to sell, the easiest to put up, the most satisfactory to handle.

THE ONE THAT WILL ALWAYS GIVE SATISFACTION TO YOUR CUSTOMERS.



VICTORY

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CONTINUED SUCCESS

ALWAYS ATTEND THE DEALERS WHO HANDLE OUR

"SUNRAY" WATER HEATERS.

No heater has ever been so successful.

OVER 1,000 IN USE AND EVERY ONE GIVING THE BEST OF SATISFACTION.

SEND FOR NEW CATALOGUE AND PRICE-LIST.

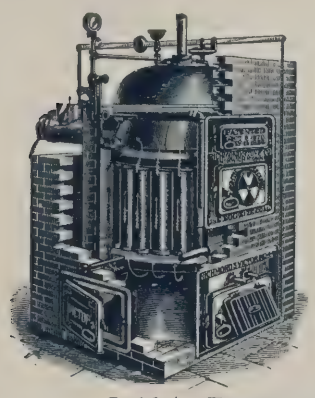
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STEAM AND HOT WATER HEATERS.



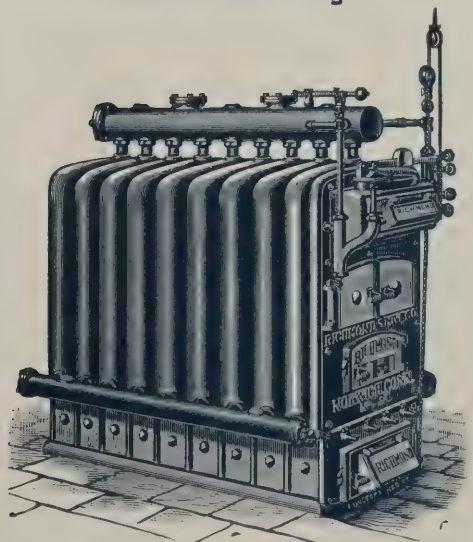
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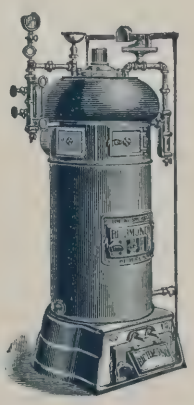
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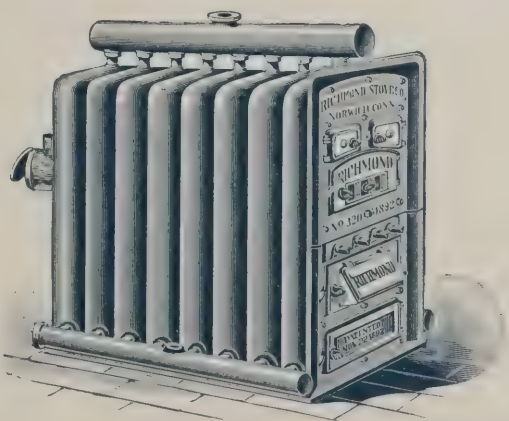


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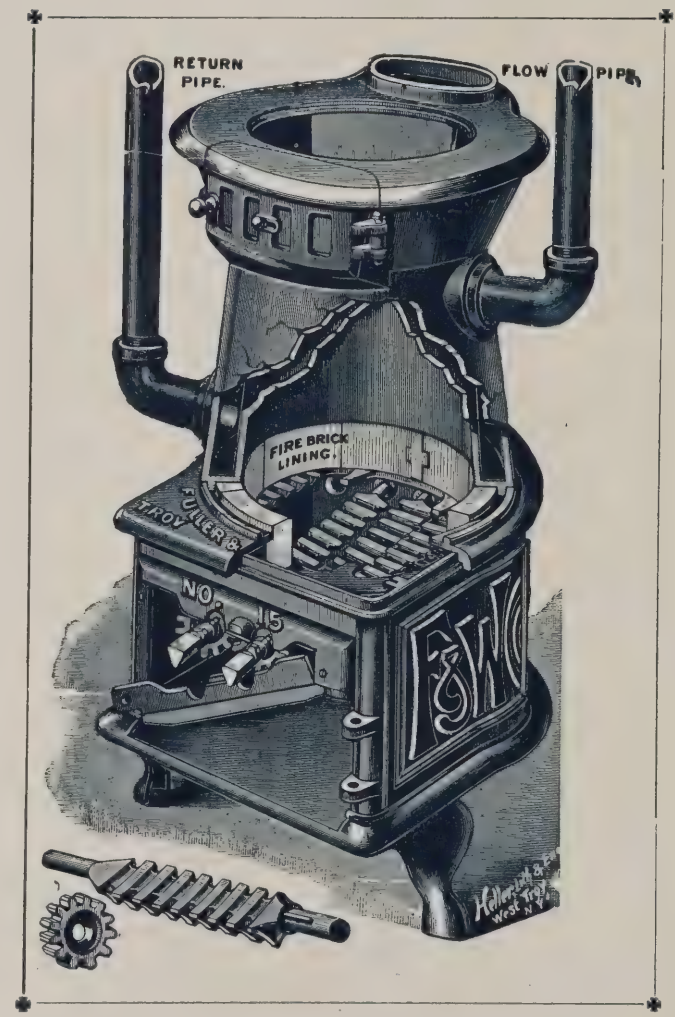
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GUARANTEED HOT-WATER HEATERS.

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Shops, ...
Laundries, . . .
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Green . . . . . .
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SIMPLE

Method of . . .
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Grate and . . .
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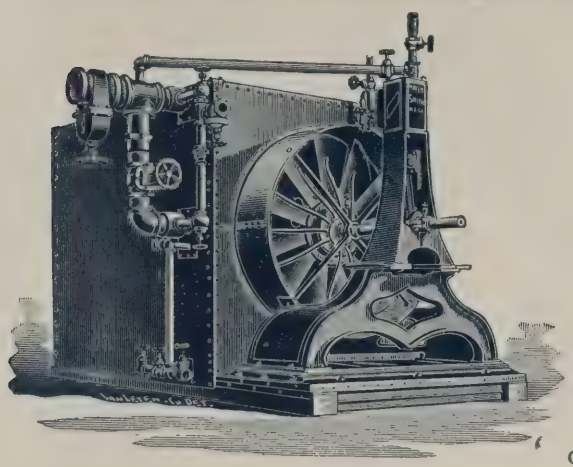
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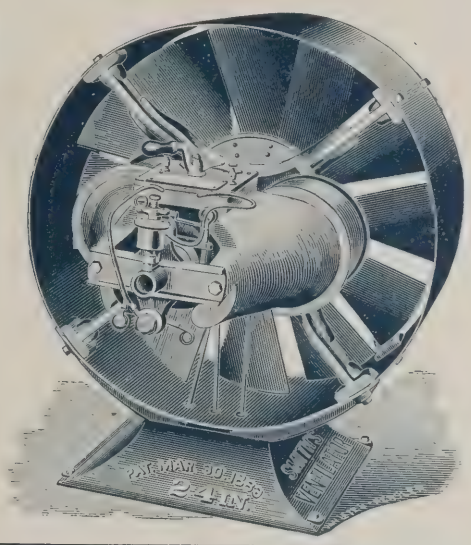
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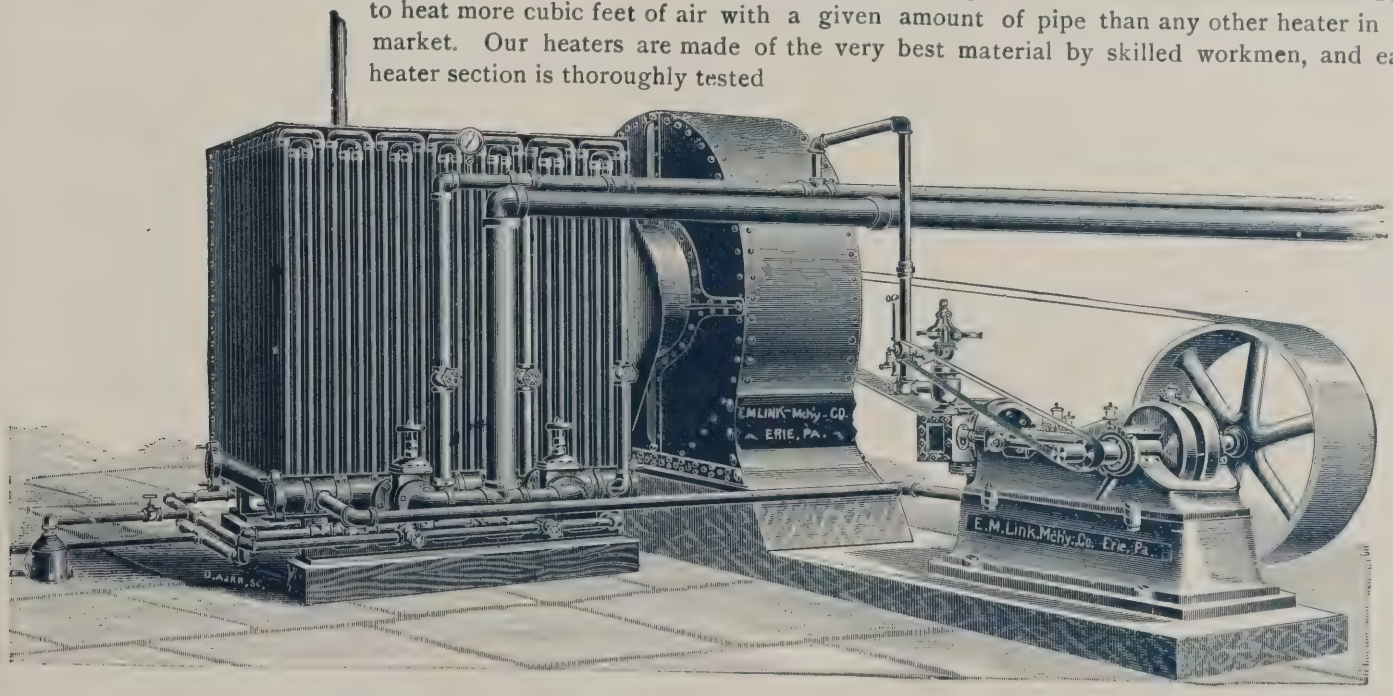
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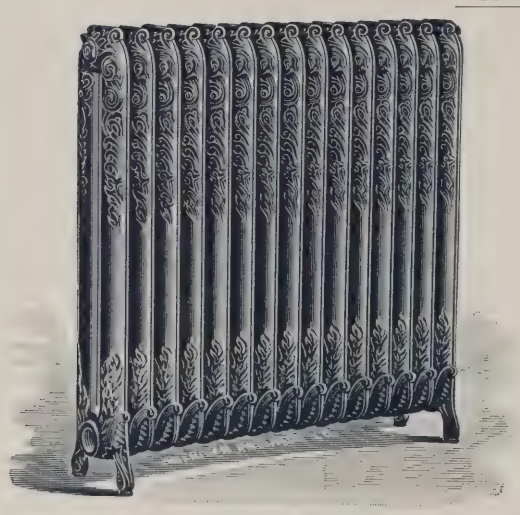
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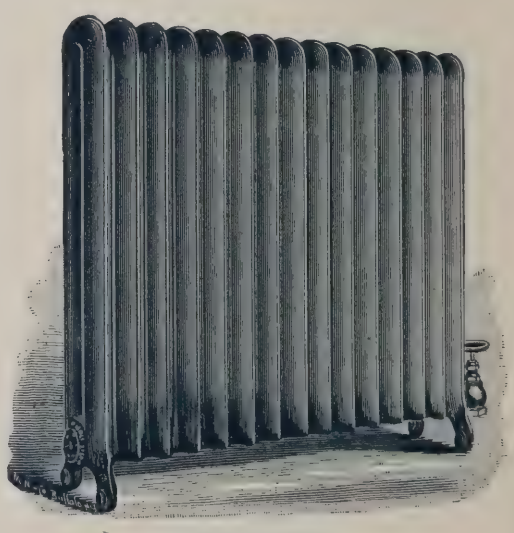
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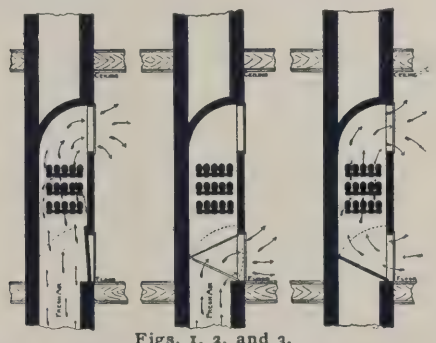
NEW YORK. JUNE 15, 1894. CHICAGO.
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Ventilation and Warming of the Greenwich School.

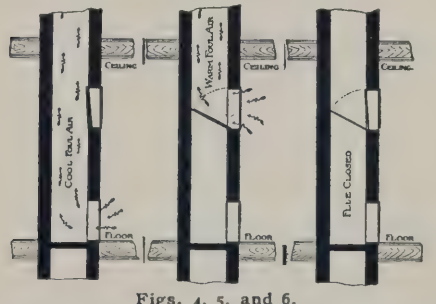
In this new building is found nearly all that money can furnish in the way of architectural skill, artistic design, thoroughness of construction, and completeness of detail. The building is a gift to the town by a gentleman and wife of New York city, whose names are everywhere recognized as synonyms of wealth and culture. To carry out their ideas, architects of highest reputation for skill in school construction were selected, after three other architects of prominence in the designing of a different class of buildings had in turn failed to combine the useful with the beautiful to the satisfaction of their clients. Since so great care was exercised in the planning and so much money expended in the construction, in the efforts to build the ideal school, we have selected the system of ventilation and warming as one likely to be of special interest. The engineers state that they were allowed all the money they required to carry out their plans, and if there is any defect, they alone are responsible for it. The perfection of a system is only to be judged by its success in meeting the conditions under which it is to be used. Therefore a proper understanding of the conditions is the first requisite for an impartial judgment of the merits of the method employed.



HAVEMEYER SCHOOL BUILDING, AT GREENWICH, CONN.

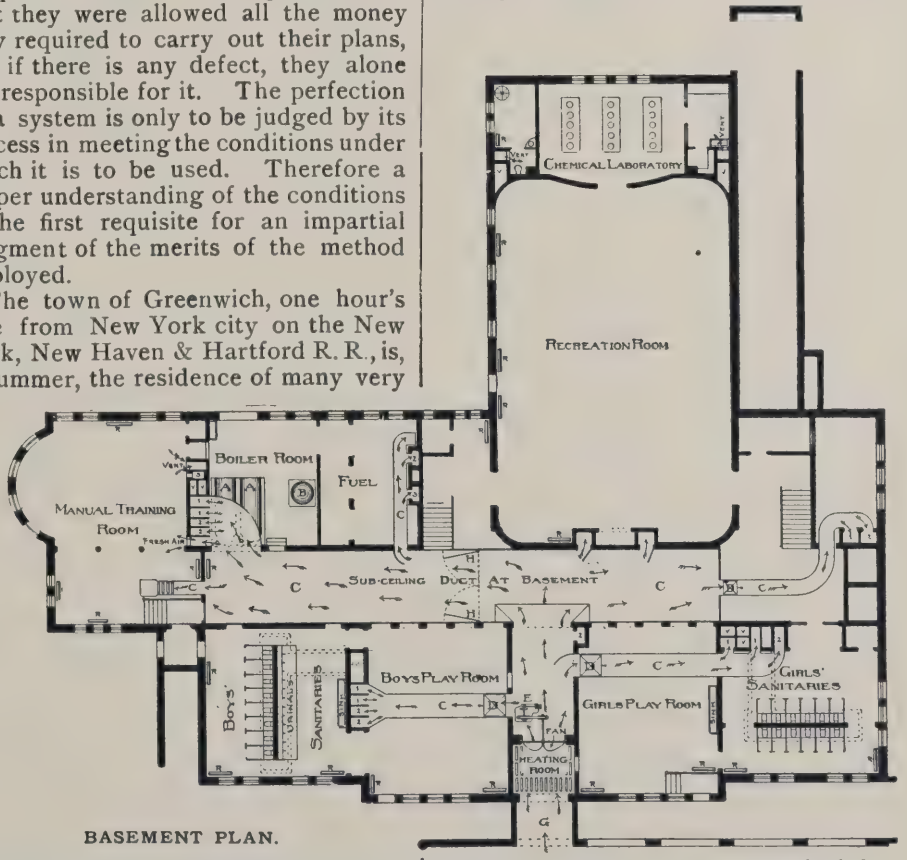


Figs. 1, 2, and 3.



Figs. 4, 5, and 6.

The town of Greenwich, one hour's ride from New York city on the New York, New Haven & Hartford R. R., is, in summer, the residence of many very prominent society people who, for four months, give a population which in winter becomes reduced to that of a quiet, thriving suburban village. It was of the utmost importance, therefore, that the system of heating should be of the simplest possible character in order to avoid the necessity of expert engineers for its operation. Otherwise the building might become an expensive luxury, compared to which a white elephant would be an economical investment. The problem of the engineers was, therefore, to meet the highest



BASEMENT PLAN.

standard of modern ventilation with a system adapted to the running expenses of a not very large community.

To meet these conditions, the first point settled was that the heating should be by hot water rather than steam, because its management was simpler, its chances of danger less, and the fuel consumption smaller. A

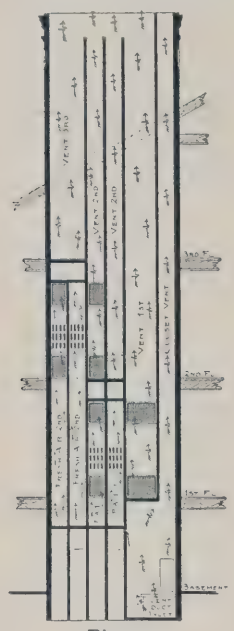
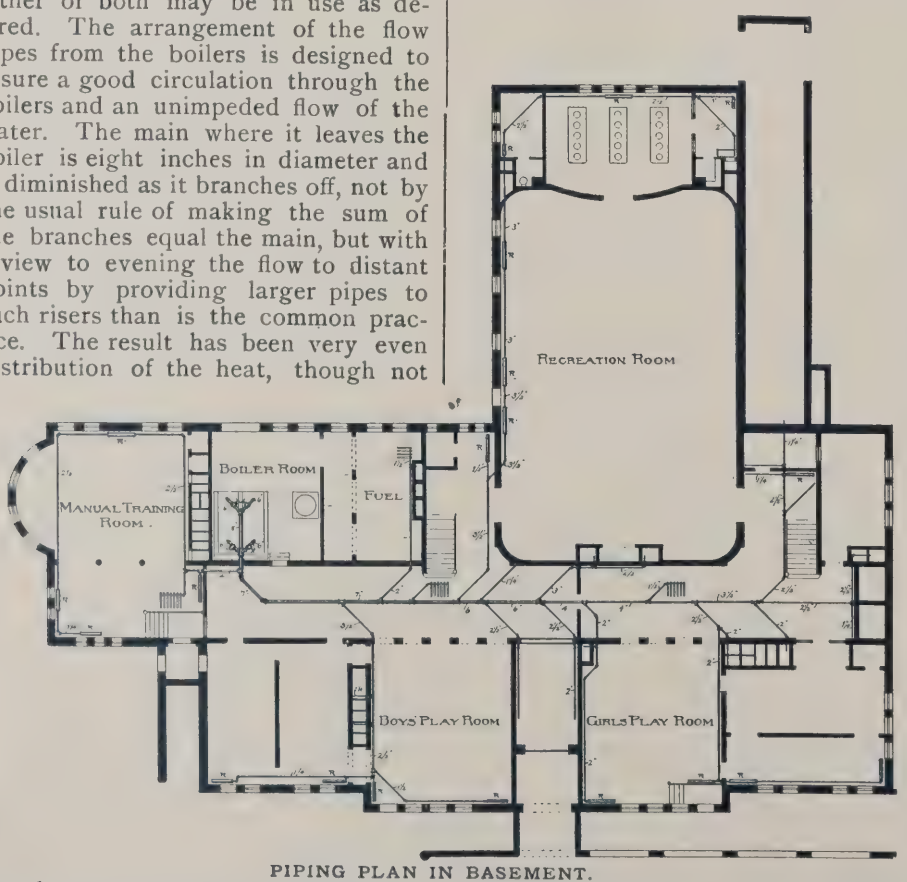


Fig. 7.



Fig. 8.

glance at the plans will show this to be an extensive hot water plant. The heating power consists of two tubular boilers of about 80 horse-power each, of the "wagon top" form, made by Wm. Allen & Sons of Worcester, Mass., built specially for hot-water circulation by filling the usual steam space with tubes. These boilers are so connected and supplied with valves that either or both may be in use as desired. The arrangement of the flow pipes from the boilers is designed to insure a good circulation through the boilers and an unimpeded flow of the water. The main where it leaves the boiler is eight inches in diameter and is diminished as it branches off, not by the usual rule of making the sum of the branches equal the main, but with a view to evening the flow to distant points by providing larger pipes to such risers than is the common practice. The result has been very even distribution of the heat, though not

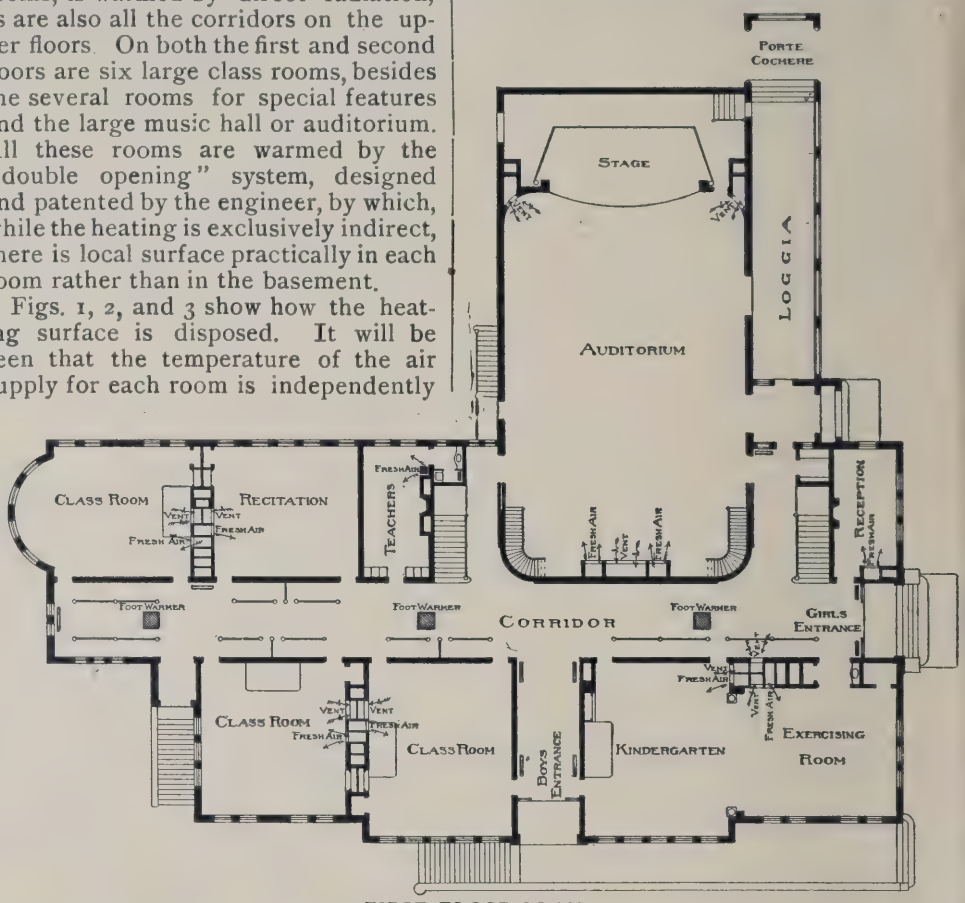


PIPING PLAN IN BASEMENT.

less than 1,800 square feet of radiation in the basement are below the tops of the boilers.

As just mentioned, the basement, which is fully occupied by chemical laboratory, manual training school, boys' and girls' sanitaries, and exercise rooms, is warmed by direct radiation, as are also all the corridors on the upper floors. On both the first and second floors are six large class rooms, besides the several rooms for special features and the large music hall or auditorium. All these rooms are warmed by the "double opening" system, designed and patented by the engineer, by which, while the heating is exclusively indirect, there is local surface practically in each room rather than in the basement.

Figs. 1, 2, and 3 show how the heating surface is disposed. It will be seen that the temperature of the air supply for each room is independently



FIRST FLOOR PLAN.

controlled, and that the air may enter the room near the ceiling through the heating surface when warm air is needed, or near the floor, beneath the radiator, when no heat is required. A third condition is caused when the lower damper valve is set as in Fig. 3, for use when the room is unoccupied. This latter feature is one of great value when it is considered that of the 168 hours of each week when the building must be heated there are only about 30 hours when ventilation, or a fresh air supply, is desired. The system of heating differs from other fan or forced systems in that the warming is independent of the fan, without the supplementary direct radiation usually required.

Another valuable feature is that the fresh air supply may be readily made to follow the pupils from room to room, thus diminishing the volume to be furnished by the fan. For example, the large music hall or auditorium may be simply heated while the school rooms are being ventilated, or *vice versa*, but all are warmed ready for occupancy at any time.

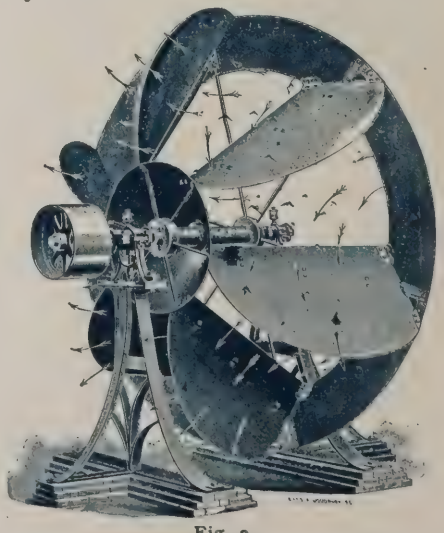


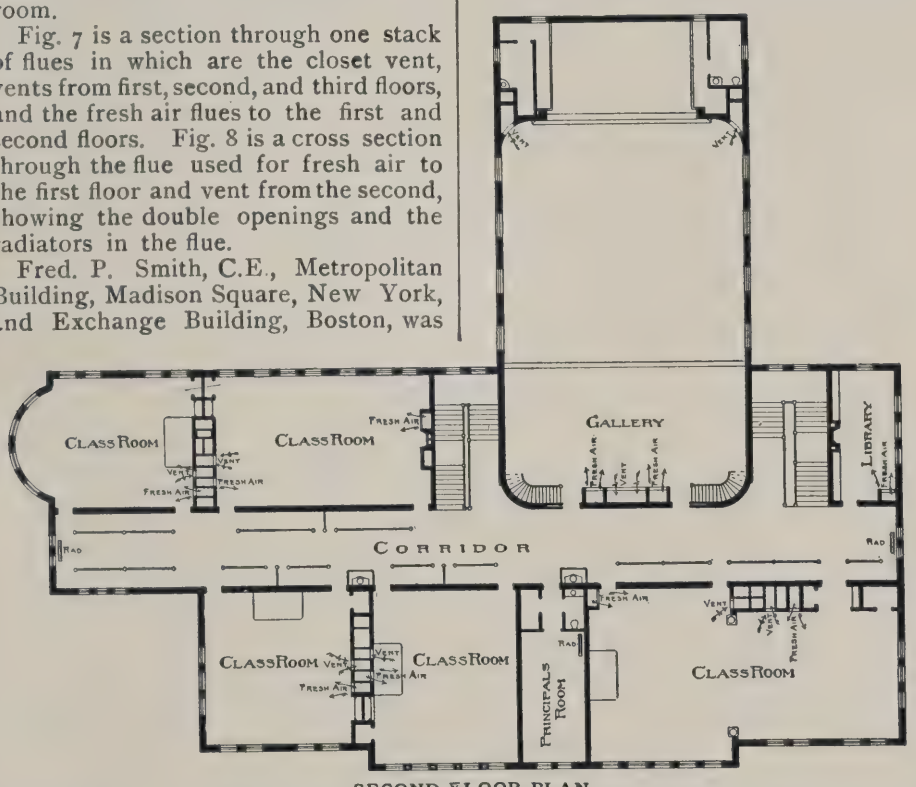
Fig. 9.

The fresh air is driven to the radiators in the several flues by a centrifugal fan of new design, which is shown in

Fig. 9. This fan is eight feet in diameter and is driven by a special Donegan & Swift "Acme" engine, the steam for which is taken from a small vertical tubular boiler of about 30 horse-power. This small boiler also furnishes steam for the tempering stacks of Pierce Excelsior indirect radiators, which are within the fresh air room. In Figs. 4, 5, and 6 are shown the exhaust outlets for vitiated air. It will be seen that the systems of both inlet and outlet openings are reversible. The engineer is strongly urging that the proper conditions for winter, when the fresh air enters near the ceiling, warm, and the foul air is exhausted at the floor, is the reverse of right when all the fresh air enters cool in warm weather The claim is made that the system should conform to the weather conditions, and that the very reason for exhausting from the floor in winter, because the fresh air is at the ceiling, is the argument for removing the foul air from the ceiling in warm weather because the fresh air will then fall to the floor, being cooler than the room.

Fig. 7 is a section through one stack of flues in which are the closet vent, vents from first, second, and third floors, and the fresh air flues to the first and second floors. Fig. 8 is a cross section through the flue used for fresh air to the first floor and vent from the second, showing the double openings and the radiators in the flue.

Fred. P. Smith, C.E., Metropolitan Building, Madison Square, New York, and Exchange Building, Boston, was the engineer. The Smith Heating and Ventilating Co., of Boston, had the general contract for the heating, ventilation, and sanitary system. Messrs. Loring & Phipps, of Boston, Mass., were the architects.



SECOND FLOOR PLAN.

WHATEVER the make of a gauge it should be of such strength in the sections which resist pressure that no tendency to a permanent set in the tube or spring can be developed under any pressure which the gauge will register.

USE as few bends and valves as possible, and run every pipe in as direct a line as practicable, and where convenient use full round bends rather than elbows. Valves, returns, and elbows increase friction more rapidly than length of pipe, and no pump can work satisfactorily that does not have a full supply of water.

A Furnace Efficiency Test.

BY R. S. KENT, M.E.

The accompanying table gives the data and results of a 27-hour trial made by the writer on February 1 and 2, 1894, to determine the efficiency of the Columbian furnace, a sectional view of which is presented herewith.

The thermometers used in the test were of Queen & Co. standard make and were tested and guaranteed to be correct. The temperatures were noted every fifteen minutes. The thermometers were hung in the cold and hot air pipes.

The fuel used was egg coal. The coal and ashes were carefully weighed, and allowance was made for unburnt coal remaining at the conclusion of the test.

The cold-air pipe was a tin duct 10 inches in diameter. The heat pipes were four in number, three of which were 7 inches in diameter, the other being 8 inches in diameter.

The furnace was 40½ inches long, 24½ inches wide and 53¾ inches high, the weight of the castings being 537 pounds. There were 12 boiler tubes each 3¼ inches in diameter and 3 feet long.

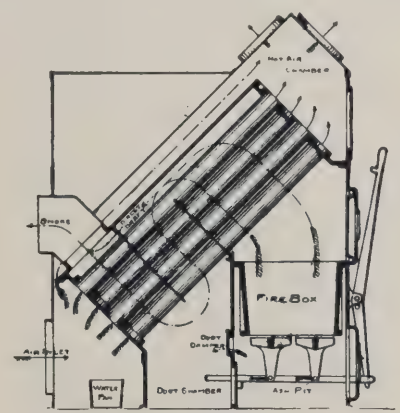
The efficiency formula for the entire furnace is as follows: $E = \frac{B}{1 + A(\frac{F}{S})}$ in which S and F represent respectively the number of square feet of heating surface per square foot of grate, and the number of pounds of fuel burned per square foot of grate per hour. The values for the constants A and B as given by Rankin are as follows:—ordinary construction, chimney draft $A = 0.5$ and $B = 0.9$. S was taken at 37.26.

The efficiency formula for the heat generating part of the furnace is as follows: $E = \frac{T_1 - T_2}{T_1 - T_3}$ in which T_1, T_2, T_3, are respectively the temperatures of the furnace, of the chimney, and of the external air.

In conclusion I will quote Professor Thurston, who says: "The transfer of heat is due to convection largely. It is obvious that where transfer of heat takes place from one fluid to another through the sides of a containing vessel, the two fluids should be so circumstanced that their currents should flow in opposite directions, the heating or the cooled fluid entering on the heating surface of the boiler or other vessel at its point of maximum temperature, and passing off at the coolest part; while the cooling or heated fluid, the receiver of heat, should come into contact with the separating sheet of metal at its coldest part and pass off at the hottest." These instructions have been embodied in the heater on which the above test was made, and the high efficiencies were therefore anticipated.

DATA OF TEST.

Grate surface, 12 by 18 inches, sq. ft.	1.5
Air heating surface for tubes, sq. ft	24.05
" " " for back and tube plates, sq. ft.	13.21
Air heating surface total, sq. ft.	37.26
Ratio of grate to above air heating surface	1 to 24.84
Air heating surface for sides, sq. ft.	15.00
" " " " " effective, sq. ft.	10.00
" " " total effective, sq. ft.	47.26
Ratio of grate to total effective air heating surface	1 to 31.51
Temperature external air, degrees	32.27
" cellar	61.92
" air leaving furnace	288.20
" escaping flue gases	264.62
" air entering furnace	32.27
Cost of coal per 2240 pounds at furnace, dollars.	5
Total amount of coal consumed, including wood, lbs.	213.40
Total refuse dry (38 lbs.) per cent.	13.12
" combustible, lbs.	175.4
Coal consumed per hour, lbs.	7.90
Combustible consumed per hour, lbs.	6.50
Coal consumed per hour per sq. ft. heating surface, lbs.	0.25
Coal actually burned, per sq. ft. grate surface per hour, lbs.	5.27
Heat units liberated during combustion of coal	2,543,300
Heat units liberated per pound of coal	11,918
Efficiency of furnace, Rankin's formula, per cent.	85
Efficiency of heat-generating part of furnace, assuming temperature of fire to be 2200° F. per cent	90.6
Heat units absorbed by air in passing through furnace	2,161,850
Heat units not absorbed, which were carried up flue and radiated into cellar, amounting to 15 per cent	381,495
Heat units carried up flue with gases of combustion (100 per cent — 90.6 per cent = 9.4 per cent)	239,070
Heat units radiated into cellar	142,425
" " absorbed per hour	80,067
" " " " sq. ft. heating surface	68,607
Heat units absorbed per hour per sq. ft. heating surface	2,541
Cu. ft. of space heated per hour per sq. ft. heating surface at 4.3 B.T.O. per cu. ft.	591
Lbs. coal per 1000 cu. ft. space heated per hour	0.42
Cost in cents per 1000 cu. ft. space heated per hour	0.9



FURNACE EFFICENCY TEST.

Never use pipes of less diameter for pumps than that specified by the builders. In long pipes this should be increased to allow for increased friction, especially in suction pipes.

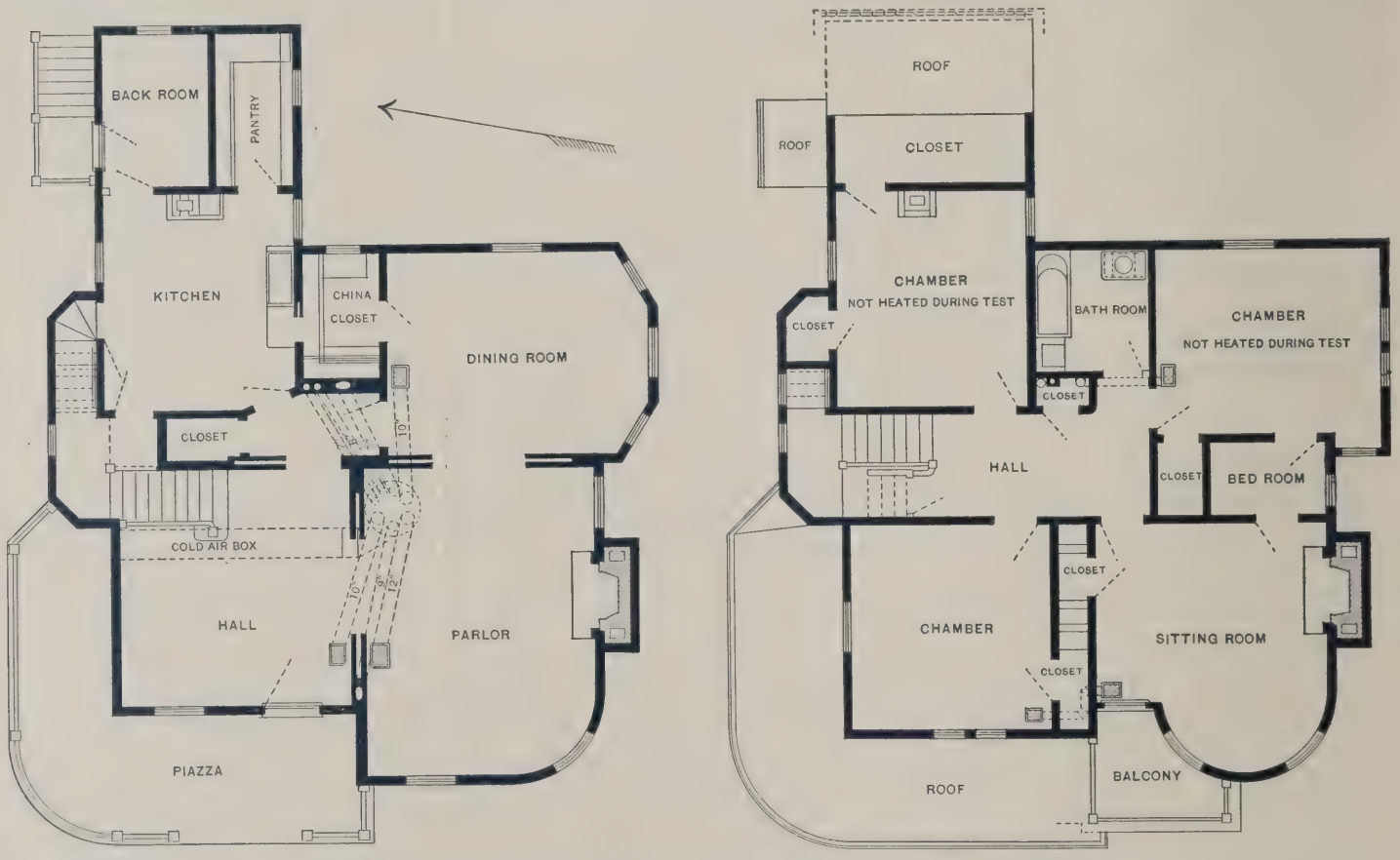
A Furnace Test.

Walter B. Snow.

Mere curiosity as to the operation of a furnace prompted the test of which the following is a brief description. Relative rather than extremely accurate results were sought, but nevertheless a somewhat interesting action on the part of the furnace was observed, and one or two accepted facts were rendered, if possible, a bit more emphatic.

The house which this furnace was designed to heat, and in fact has heated to the owner's satisfaction, is a modern suburban residence about 32 by 35 feet in general floor plan, exclusive of projecting bay windows, pantry, closet, and the like, and is two stories in height, with attic.

It was carefully built of wood with matched outside boarding, building paper under the clapboard, and thoroughly back-plastered. The accompanying floor plan of the first and second floors presents the general arrangement of rooms and the location of registers therein, the former showing in dotted lines the location of the furnace in the cellar, with cold air box and register pipes. The house is located upon a side hill exposed to north and west winds, its position relatively to the points of the compass being shown on the plan.



The furnace, installed about four years ago, is a No. 3 Boston heater, built by the Magee Furnace Co. of Boston, Mass. It is of the portable type, and has a wrought-iron fire pot and top, the net diameter of the former, lined with fire brick, being twenty-two inches. A simple cold air box extends from the bottom of the furnace nearly up to the ceiling, and thence at a slight inclination upward continues to an opening in the north wall. It is of wood, built of matched stock, 13 by 24 inches inside, reasonably tight when new, but now so shrunken as to give ample opportunity for considerable leakage of air. The supply from out of doors is controlled by a fairly well-fitted slide, while an opening, closed by a door $7\frac{3}{4}$ inches by 24 inches, serves as a communication with the cellar. The direct area through the box is therefore 312 square inches, or 2.17 square feet, while that through the door is 186 square inches, or 1.29 square feet. The aggregate area of all the pipes, seven in number, connecting with the furnace top, is 439 square inches, or 3.05 square feet.

The test was made during the evening, the thermometer standing at 14 degrees outside, and a moderate northwest wind blowing. The fire, which had been thoroughly cleaned in the morning, had not since been touched save to supply it with fuel (common furnace coal), and during the evening was in average condition, all drafts being closed. Of course the fire, if forced, would have given very different results, but special conditions were not desired. The dampers were closed in the hot-air pipe leading to two of the second floor chambers; in fact, it was customary to keep them closed, as the rooms were usually comfortably warm on account of their location and protection.

The temperature of the air entering the furnace was taken from a thermometer permently located in the cold-air box, where it could not be affected by any radiation from the furnace. Volumes and velocities were determined by means of an ordinary Negretti & Zambra anemometer. Temperatures at the registers were taken by high grade thermometers, either immediately above or in front of the registers, according as they were in floor or wall. Velocities at the registers were all taken in the same manner by a continuous movement of the anemometer back and forth across the entire free area of the register and three inches from it A number of these results were checked satisfactorily by mere repetition, but no direct attempt was made to determine the exact accuracy of this method.

The volume of air passing through the registers was calculated by merely multiplying the entire gross area of the perforated portion of its face by the velocity as determined. At a distance of three inches from the register the various currents of streams of air produced by passing through the openings should at this low velocity unite in one mass to form a continuous flowing volume. The results obtained, however, are not such as to warrant the basing of any important assumption upon them.

Three separate tests were made, as exemplified in the accompanying tables. The tendency to excessive leakage through the ordinary cold-air box, and the effect of changing the source of supply, were prominent as matters to be investigated, and hence the conditions under which the tests were conducted.

In test No. 1 the slide in the cold-air box was closed in the ordinary manner, no special precaution being taken to prevent leakage. The cold-air box door which was located in the vertical portion from the furnace connection was opened, and the volume of air passing through the opening was determined by moving the anemometer back and forth across the opening, thus, so far as possible, obtaining the average velocity. The leakage past the cold-air box slide and that through the sides

of the box itself was investigated by a similar movement of the anemometer inside the box just above the door. The effect of the air current upon the instrument was, however, so very slight and intermittent as to make the accuracy of the results very doubtful. As thus determined, the leakage was about 20 per cent of the total amount entering the furnace.

Marked differences will be noted between the observed temperatures and velocities at adjacent registers, while higher velocity through the second floor registers (sitting room, chamber, and bath room) is very noticeable; that through the bath room register being over 16 per cent greater than that observed in the dining room. On the other hand, there was a difference of over 12 per cent in the temperature of the air entering the parlor and that leaving the register in the front chamber.

The "volume of air at register reduced to mean temperature of air entering furnace," as indicated in the table, was obtained by merely making allowance for the expansion of the air due to an increase in temperature.

At the conclusion of this test an interesting and suggestive experiment was made. All of the registers in the house were closed with the exception of that in the sitting room, which, by previous test, was shown to pass the air at nearly the highest velocity recorded. The temperature of the air passing just before this experiment was 140 degrees (slightly below that previously observed), but this almost immediately arose to 193 degrees when this became the only register through which the entire supply of the furnace could be discharged. The velocity likewise increased from 170 feet per minute to 359 feet—more than double—but the total volume fell far short of the previous aggregate volume through all the registers, being only 215.4 cubic feet at the observed temperature, equivalent to 173.6 cubic feet at the entering temperature of 63 degrees. Some idea can thus be formed of the gain that will result from shutting all registers except that in the one room to be heated. In this case the total air volume delivered to the house was reduced nearly two-thirds. As all air supplied must also escape at the temperature maintained within the room, there is obviously, however, a greater gain than in the mere increase of temperature.

The second test was conducted in very much the same manner as the first. The velocity in the cold-air box, which was now open to outdoor air and nominally closed to the cellar, was ascertained by attaching the anemometer to a thin stick wedged between the door and the side of the opening so as to hold the instrument as near the center of the box as possible. It was opened from the outside by strings attached to a lever on the anemometer. There was no opportunity for movement of the instrument as in the previous cases. The loose fit between the door and box which made possible the insertion of the stick also served as an excellent opening for the leakage of air from the cellar to the furnace, the amount of which it was impossible to determine. That there was such leakage is clearly shown by the temperature of the entering air, which was 24 degrees, far too high to be accounted for by the mere heating of the cold air as it passed through the air box from a temperature of 14 degrees outside.

The drop in temperature of air as it leaves the registers is noticeable as compared with the first test, being, of course, principally due to the decreased temperature of the air supplied by the furnace, but also to its increased volume and the greater duty thereby demanded of the furnace. A closer agreement is shown between the total volume observed at the cold-air box and at the registers. Greater equality in temperature existed at the various registers, but a serious change in relative velocities is to be noticed. The bath room, which previously had the highest velocity, now falls considerably below the maximum, while the velocity in the dining room is increased considerably over 80 per cent.

The third test, with all air supplied to the furnace nominally shut off, illustrates very clearly the inadequacy of the ordinary wooden cold-air box as a conduit for fresh outdoor air uncontaminated by that of the cellar. It was expected that considerable leakage would be observed, but that the volume would anywhere near approach that in the previous tests was by no means anticipated. No correction of volume for temperature was attempted in this table, but 399.5 cubic feet at the aggregate at the various observed temperatures certainly appears clearly in its relation to 682.1 cubic feet in the first and 847.1 cubic feet in the second test.

More interesting, however, is the reverse current developed through the dining room register, thereby partly making up for the lack of cold-air box supply. In reading the anemometer it was not at first observed that the current was into rather than out of the register, but there was supposed to be a mistake in reading on the part of the observer. A second trial, however, made evident the direction of the current, and the record has therefore been preceded by a minus sign. The currents thus passing downward were intermittent and exceedingly variable in velocity. The velocity through the sitting room and bath room registers is noticeably high as compared with that in the first floor.

During the tests all of the rooms were in their normal condition as regards open doors, lights, occupants, and the like. They were all at or near a temperature of 70 degrees. Lower sliding doors being open between parlor and hall made of them practically one room, and yet some of the greatest variations are observed in the readings at these two registers.

Under maximum observed conditions of air supply the volume admitted to the parlor would be sufficient to change its entire contents once in eighteen minutes, or in the sitting room in 17 minutes. At 30 cubic feet per head per minute the air supply to the parlor under these conditions would be more than sufficient for five persons, and that to the sitting room more than sufficient for three persons. This gives at least an idea of the adequacy of the furnace in matters of ventilation with the ordinary number of occupants, and its inadequacy when this number is exceeded, as in the case of a social gathering.

TEST NO. 1.—COLD AIR BOX CLOSED TO OUTER AIR, OPEN TO CELLAR.

	Dining Room.	Parlor.	Hall.	Sitting Room.	Chamber.	Bath Room.	Means and Totals.
Mean temp. of air entering furnace	....	....	....	....	....	....	63°
Volume of air entering furnace	....	....	....	....	....	....	379.1 cu. ft.
Temp. at register	148°	173°	152°	144°	143°	136°	151°
Size of register	10×14	12×15	10×14	8×12	8×10	8×10	....
Velocity at register	105.5 ft.	169 ft.	142 ft.	170 ft.	166 ft.	174 ft.	154.4 ft.
Volume at register.	92.2 cu. ft.	196 cu. ft.	124.1 cu. ft.	102 cu. ft.	82 cu. ft.	85.9 cu. ft.	682.1 cu. ft.
Volume of air at reg. reduced to mean temp. of air entering furnace	77.2 "	163.6 "	119.1 "	88.3 "	71.1 "	74.1 "	593.4 "

TEST NO. 2.—COLD AIR BOX CLOSED TO CELLAR, OPEN TO OUTER AIR.

	Dining Room.	Parlor.	Hall.	Sitting Room.	Chamber.	B. th Room.	Means and Totals.
Mean temp. of air entering furnace	....	....	....	....	....	....	24°
Volume of air entering furnace	....	....	....	....	....	....	551.2 cu. ft.
Temp. at register	104°	109°	106°	93°	92°	95°	99.8°
Velocity at register	192 ft.	224 ft.	210 ft.	157 ft.	103 ft.	184 ft.	178.3 ft.
Volume at register,	167.8 cu. ft	259.8 cu. ft.	183.5 cu. ft.	94.2 cu. ft.	50.9 cu. ft.	90.9 cu. ft.	847.1 cu. ft.
Volume of air at reg. reduced to mean temp. of air entering furnace	143.9 "	112.1 "	156.7 "	82.5 "	44.6 "	79 "	618.8 "

TEST NO. 3.—COLD AIR BOX CLOSED TO OUTER AIR AND TO CELLAR.

	Dining Room.	Parlor.	Hall.	Sitting Room.	Chamber.	Bath Room.	Means and Totals.
Mean temp. in cold air box	....	....	....	....	....	....	58°
Temperature at register.	68°	127°	170°	144°	142°	146°	132.8°
Velocity at register	−76 ft.	72 ft.	115 ft.	186 ft.	153 ft.	187 ft.	106.2 ft.
Volume at register	−66.4 cu. ft	83.5 cu. ft.	102.8 cu. ft.	111.6 cu. ft.	75.6 cu. ft	92.4 cu. ft.	390.5 cu. ft.

The few results of the simple practical test as here presented will serve in some degree to throw light upon the action of the furnace heating system under ordinary conditions, and possibly make clearer the cause of certain failures where this method has been introduced.

Improved Root Water Tube Boiler.

In connection with the article on Steam and Hot Water Boilers, in our April issue, several installations of the improved Root water tube boiler were shown, but lack of space precluded a description of them and of the special advantages of boilers of that type for heating purposes.

The floor space occupied by a boiler plant is often a matter of much importance and demands no small amount of consideration from those who are placing steam equipments in modern office buildings, hotels, apartment houses, and similar structures. This is doubtless one of the reasons why architects, engineers, and steam fitters have been so greatly attracted to boilers of the Root type, which have fitted so nicely into the many odd nooks and

TABLE I.—SPACE OCCUPIED BY HORIZONTAL TUBULAR BOILERS.

Horse-power of plant.	Number of boilers.	Horse-power of each boiler.	Diameter of boiler in inches.	Length of boiler in feet.	Settings.			
					Length.		Width.	
					Feet.	Inches.	Feet.	Inches.
100	2	50	54	12	16	11	14	9
150	2	75	60	15	20	3	16	9
200	2	100	66	16	21	11	17	9
300	3	100	66	16	21	11	25	10
400	4	100	66	16	21	11	33	11
500	5	100	66	16	21	11	42	0

contracted spaces which are allotted to the poor boiler plant, on which so much depends. As this is a matter of considerable interest to many of our readers, we have prepared tables of comparison of the spaces occupied by several plants of horizontal tubular

TABLE II.—SPACE OCCUPIED BY IMPROVED ROOT BOILERS.

Horse-power of plant.	Number of boilers.	Horse-power of each boiler.	No. of tubes in width.	No. of tubes in height.	Length of tubes in feet.	Settings.			
						Length.		Width.	
						Feet.	Inches.	Feet.	Inches.
100	2	51	4	9	12	16	10	9	7
150	2	78	6	7	15	19	6	12	3
200	2	101	8	9	12	16	10	14	11
	2	104	6	10	15	20	0	12	3
300	2	159	10	9	15	19	10	17	7
	2	151	8	9	18	22	6	15	7
400	2	208	12	10	15	20	0	20	3
	2	206	10	10	18	22	8	18	3
500	2	263	14	11	15	20	2	22	11
	2	248	12	10	18	22	8	20	11

boilers of various sizes, with no spacing between them, and also the space occupied by corresponding plants of Root boilers. In these tables we have assumed that no less than two boilers are placed in any one plant, as often one boiler is ample for summer use; and besides, by this arrangement, we are not "carrying all of our eggs in one basket." We have also assumed that in the average plant it is exceptional to find horizontal tubular boilers of over 100 horse-power capacity. On the contrary, with boilers of the Root type, which are often made in units of 350 horse power and over, with no falling-off in the economical results of their performance, large units seem to be favored in preference to small ones, because where fewer fires are required they are more easily cared for, and the space occupied by one boiler is less than that required by two or more.

Another reason often given by those favoring boilers of the Root type is that a disastrous explosion with them is impossible. This is, by far, too important a point to be overlooked, as in most cases heating boilers are placed in the cellars of buildings, above which are many people, and an explosion would result in a considerable loss of life and a more or less wrecked building.

This, whether rightfully so or not, reflects discreditably on the architect, engineer, or other person, who was responsible for the installation of the exploded boiler, and the owner of the building pays dearly for it in the end—damage to building, lawsuits, and other such incidentals.

By referring to the views and description of the Root boiler it will be seen that the water which circulates through it is cut up in many small bulks. In case a rupture should take place no large amount of water is liberated at once, as it can issue only through the rupture, just as the steam escapes through the safety valve, and the result can have but little more effect. It merely means the gradual emptying of the water in the boiler, and, in addition, possibly the extinguishing of the fire, which would prevent the burning and destruction of the empty boiler. A third reason for adopting this type of boiler is that, it being perfectly safe from explosion, higher pressures can be carried with perfect safety. High pressure means first, a smaller boiler (and consequently less floor space) to do the same work; secondly, much greater uniformity in the work done (heating or otherwise); and last, but not least, greater economy of fuel.

As the advantages gained by using high pressures are not generally appreciated, we propose to call some of these to our readers' attention.

In the first place, we will speak of economy, and if the reader will refer to the steam tables (we have Peabody's tables before us from which we quote) he will notice that the pressure of the steam increases in a greater ratio than its weight per cubic foot, whence it follows that the higher the pressure to which the stream is raised, the less proportionate quantity of water it contains, and therefore the less fuel is consumed, since a given quantity of fuel will evaporate the same weight of water at all temperatures, approximately. This is made clear by Table III. In this table comparison is made with the use of steam at 5.3 pounds (which, added to 14.7 pounds, the atmospheric pressure, equals 20 pounds absolute), comparing it with steam at the other pressures given. Thus it will be noticed that when 120 pounds absolute is used instead of 20 pounds absolute, the pressure per square inch is six times as great, but the weight of a cubic foot of

TABLE III.

Absolute pressure, pounds.	Gauge pressure, pounds.	Density or weight per cubic foot, pounds.	If density increased in same ratio as the pressure, the weight per cubic foot would be (compared with 20 lbs. absolute).	Total heat per lb. of steam. Heat units.	Heat disappearing per lb. of steam in overcoming the external resistance to expansion. Heat units.
20	5.3	.05023	.....	1151.5	73.6
25	10.3	.06199	.06279	1155.1	74.5
30	15.3	.07360	.07535	1158.3	75.3
35	20.3	.08508	.08790	1161.0	76.0
40	25.3	.09644	.10046	1163.4	76.7
45	30.3	.1077	.11302	1165.6	77.2
50	35.3	.1188	.12556	1167.6	77.7
55	40.3	.1299	.13813	1169.4	78.2
60	45.3	.1409	.15069	1171.2	78.6
65	50.3	.1519	.16325	1172.7	79.0
70	55.3	.1628	.17581	1174.3	79.4
75	60.3	.1736	.18836	1175.7	79.7
80	65.3	.1843	.20092	1177.0	80.1
85	70.3	.1951	.21348	1178.3	80.4
90	75.3	.2058	.22604	1179.6	80.7
95	80.3	.2165	.23859	1180.7	80.9
100	85.3	.2271	.25115	1181.9	81.2
105	90.3	.2378	.26371	1182.9	81.4
110	95.3	.2484	.27627	1184.0	81.7
115	100.3	.2589	.28882	1185.0	81.9
120	105.3	.2695	.30138	1186.0	82.1

steam, instead of being 6 times the weight of that at 20 pounds (viz., .30138 of a pound) is only a little over five times as great (viz., .2695 of a pound), hence the proposition we have made.

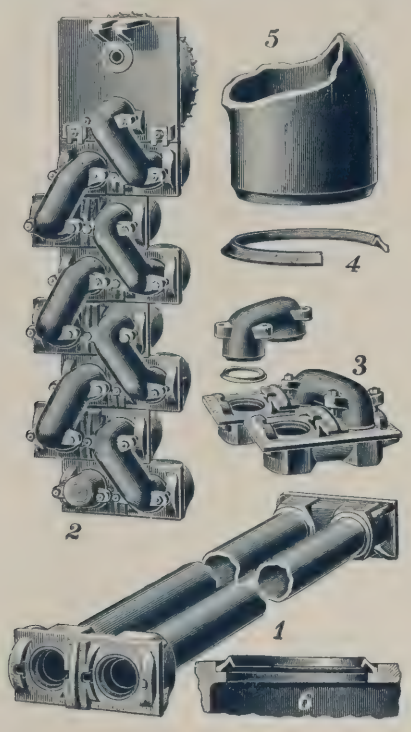
We may take another view of this. By referring to Table III, it will be seen that the total heat in one pound of steam (column 5) for 20 pounds absolute is 1,151.5 heat units, whereas for 120 pounds absolute it is 1,186 heat units, only 34.5 units more; and when we think that one pound of coal contains between 10,000 and 13,000 heat units, of which the boiler will utilize about 80 per cent, one can readily see that but very little additional coal will be required to keep up steam at 120 pounds over that required to keep it up at 20 pounds.

Any one having even but little knowledge of the great economy of steam at high pressure when used with a high rate of expansion, as in electric light engines, the modern ice machine, etc., will at once appreciate the very great saving at the engine, in the amount of steam required, when this higher pressure is used, and therefore we need not go into a discussion of the subject.

When heat is applied to water, and steam generated, the heat in the steam raised is disposed of in three ways. It raises the temperature; then it has to supply the necessary energy to expand the "cubic inch of water into the cubic foot of steam," i.e., internal work, forcing the molecules farther and farther apart; and then it has to supply the necessary energy to expand itself against its surrounding pressure, i.e., to do external work. To give an idea of this last work done by the heat, suppose we take a cubic foot of steam at 20 pounds absolute. When the pressure is raised to 120 pounds, it, of course, will be compressed into a smaller space than one cubic foot, but when it is reduced to the final volume, it exerts an opposite, outward pressure by which it retains its volume, and the amount of

energy required for this work is provided by the heat shown in column 6 of Table III.

This heat is most available when the steam is used, and reduced to a lower pressure, and therefore another cause



Figs. 1 to 6.

for increased economy of high pressures is found in the fact that there is a greater proportion between this heat required for external work (column 6) and the total heat (column 5) as the pressures increase.

Many may shake their heads at the idea of increased pressures for the purpose we have set forth. They may say that "it is too much pressure to put on our steam heating system." This difficulty is easily met by using reducing valves, and by this means economy is gained in the use of fuel and a greater uniformity secured in the working of the plant. When a good reducing valve is set to deliver steam at a certain pressure, and the boiler pressure is considerably above this, a very considerable fluctuation of pressure may occur at the boiler, without affecting the pressure of the steam delivered from the reducing valve, so that extreme uniformity is obtained throughout the heating system.

When steam is delivered to a point quite distant from the boilers for heating and other purposes, more or less condensation is apt to take place along the line of conducting pipe. By using a high pressure and placing a reducing valve at the end of the conducting pipe, it will be found that a considerable amount of moisture will disappear as the steam passes through the reducing valve, as throttling always superheats the steam, so to speak, on the same principle that steam is superheated in the Barrus throttling calorimeter. It is needless to state the great advantage thus gained in a heating system.

This very matter was well illustrated in a somewhat recent application of a Mason reducing valve in the steam plant of Jordan Marsh & Co. of Boston, Mass., where the boiler had been run under low pressure and the plant could not be successfully operated without using a separator to separate the water from the steam. The pressure was finally raised, using the same boilers, and the Mason reducing valve applied, delivering steam at the former pressure, and the steam delivered was found to be perfectly dry, which led to the taking out of the separator.

When steam is used non-expansively as in boiler feed pumps, etc., a reducing valve should be used, for steam will be wasted in such cases if the pressure is much above that absolutely necessary to do the work required.

A general idea of the construction of the Root boiler may be obtained by inspecting the cuts on this page and following the description given. Two parallel boiler tubes four inches in diameter are expanded into a header at each end (Fig. 1), forming what is known as a package. These packages are then piled one upon the other, as shown in Fig. 2, and on top of this pile is placed a steam and water drum, all forming a vertical section. A side view of this arrangement is shown in Fig. 7. The openings at the front and rear ends of these box-like headers are connected by means of connecting bends, as shown in detail in Fig. 3. These, in turn, have plug-shaped ends (Fig. 5), which are drawn tightly into elastic bronze-like metal packing rings (Fig. 4), seated in the headers (Fig. 6), this being done by means of two bolts, thus forming a joint which can easily be "made up" and kept tight.

The bolts holding the bends in place

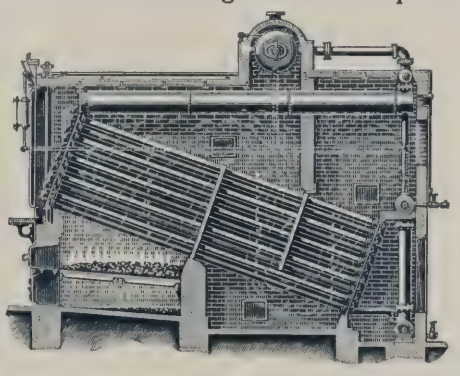


Fig. 7.

have ball-shaped heads, which are received in spherical sockets in the headers, thus giving the nut end of the bolt perfect freedom of motion.

After connecting the headers front and rear, in the manner above described (see also Fig. 2), it will be seen by referring to Fig. 7, that as the water inside the inclined tubes is heated, it will rise in them to the headers, and then it will flow upwards from one box-like header, through the connecting bend, into the one above it, and so on to the top, and thence into the overhead drum (at the front end). This overhead drum is about half full of water.

By constructing the vertical section in the manner above described, it is made a flexible one, which can readily adjust itself to the unequal expansion of the tubes, which always takes place, without placing dangerous breaking strains on the various pressure parts, especially on the vertical section. In making up a boiler, a number of these vertical sections (each virtually a complete boiler in itself), are placed side by side, the height and width of the arrangement of tubes (and we might also add the length of the tubes themselves) being governed, first by the amount of heating surface required, and secondly by the space available in which the boiler is to be set.

The method of construction at the rear ends of the boiler is plainly shown in Fig. 8, where four boilers are seen. Over the top of the several steam and water drums is shown the multiple which collects the steam from each, and finally delivers it into the steam drum. About the center, beneath the steam and water drums, is shown the feed drum, below which is seen the mud drum. When the complete boiler is constructed the headers are arranged similar to bricks in a wall, i.e., with their vertical joints broken; and as a brick can easily be removed from the lower part of a wall and replaced without disturbing those around it, similarly, a package of tubes can easily be removed and replaced in this boiler when the fittings at the end of the package are taken off. This arrangement also brings the tubes in a staggered position vertically, which prevents the gases from having a free, uninterrupted run back to the chimney, thus insuring a more perfect absorption of the heat.

In placing this boiler in position, when it takes the place of old shell boilers, the necessity for tearing up the sidewalk or street is obviated, as it can be introduced into a building through an ordinary window or door, an opening 39 inches square being sufficient for the introduction of a boiler of 350 horse-power. The old shell boilers can be cut up by a boiler maker right in position, and so taken out and the new boiler put in with but little trouble and expense.

Durability is one of the strong points in favor of boilers of this type. The new Root boiler is built entirely on the interchangeable system, so that any part may be slipped out and a new part introduced at a minimum cost and in a very short time. Thus, by keeping up with the deterioration which takes place in all boilers, it is always kept practically as good as new; the same high pressure can always be carried, and at the end of twenty years it is about as good for service as at the end of the first year. This is not the

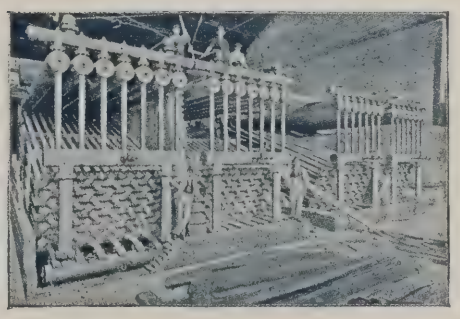


Fig. 8.

case with shell boilers, which so deteriorate that the boiler inspectors make their users carry less and less pressure each year.

Experiments on the Transmission of Heat.

BY M. H. GERRY, JR., AND E. T. ADAMS.

Heat transmission is a subject of great importance to the engineer. Its applications cover the entire field of steam power engineering, of heating, of refrigeration, and in one way or another it enters into almost all branches of mechanical engineering. Wherever there is a furnace, a heat engine, a dynamo, or a shaft turning in a journal, there are problems involving the transmission of heat.

As it is well known, heat may be transmitted in any of three ways,—by radiation, by convection, and by conduction. The experiments about to be described relate to the last two. Very little exact information of value to engineers can be found in the literature of the subject. The conduction of heat by various single substances has been investigated by a number of writers, but the results are expressed almost universally in an arbitrary comparative standard, and quantitative results are not given. Still more unsatisfactory is the information to be had relating to the transmission of heat from and through several different media. It is in this latter form, too, that the engineering problem nearly always presents itself; that is, in the form of transmission from one substance to another, and from that to still others.

Joseph Fourier has investigated this subject mathematically, but his elaborate analytical methods cannot be applied to practical cases, because his assumptions cannot be fulfilled, and many of his quantities are physically indeterminate. Tredgold experimented on the transmission of heat from water through an iron vessel to air. Isherwood and others have published experimental results of transmissions from steam through vessels of various shapes and materials, to water. In most of these experiments, however, the range of temperature worked through is small, and in nearly every case the rate of heat transfer has been assumed constant. The most complete and valuable experiments on the subject are found in the works of E. Peclet, "Traite de La Chaleur."

The series of experiments made by the writers of this paper may be divided into three clases, and these subdivided again as given in the following table:

Transmission from *steam*	through boiler plate	to water
	" cast-iron plate	
	" boiler plate and scale	
	through cast-iron plate and scale	
Transmission from *oil*	through cast-iron plate	
	" " " and scale	
Transmission from *air*	through cast-iron plate	
	" " " and scale	

The apparatus and method of making the tests may be described as follows: A non-conducting rectangular vessel was provided, and the iron plates to be tested arranged to form the bottom. Underneath this iron bottom was introduced in the different experiments, respectively, steam at atmospheric pressure, lard oil, and heated air. Above the plate when tested alone, water was caused to flow evenly over the surface by means of baffle-plates. In the experiments with scale, water was conducted over its surface in a similar manner, the joints between the scale and box being made tight by means of a little plaster of paris. The temperature of the medium under the plates was taken by means of thermometers, and where oil was used it was stirred continually to maintain a constant temperature throughout the mass. The temperatures of the water supplied and discharged were also carefully taken, and the weight of water passing through the apparatus measured for a certain length of time, usually either five or ten minutes. From the weight and temperature of the water the total B. T. U. (British thermal units) passing through the plate in the time of the run were calculated readily.

Having the time and dimensions of the plate, the rate of heat transmission in B. T. U. per square foot, per minute, and per degree, was readily obtainable.

In every case the rate of transmission increased with the temperature. In all cases, except that of steam, the increase of rate, as near as can be observed from the experiments, is directly proportional to the temperature, and follows the laws of Newton as given by Peclet.

$$v = q\,t$$

where v = equals rate; t = difference of temperature; q = a coefficient variable with the media, its surface conditions, etc.

In case of steam the rate increases faster than the difference of temperature, and may be expressed very nearly in a form given by Peclet:

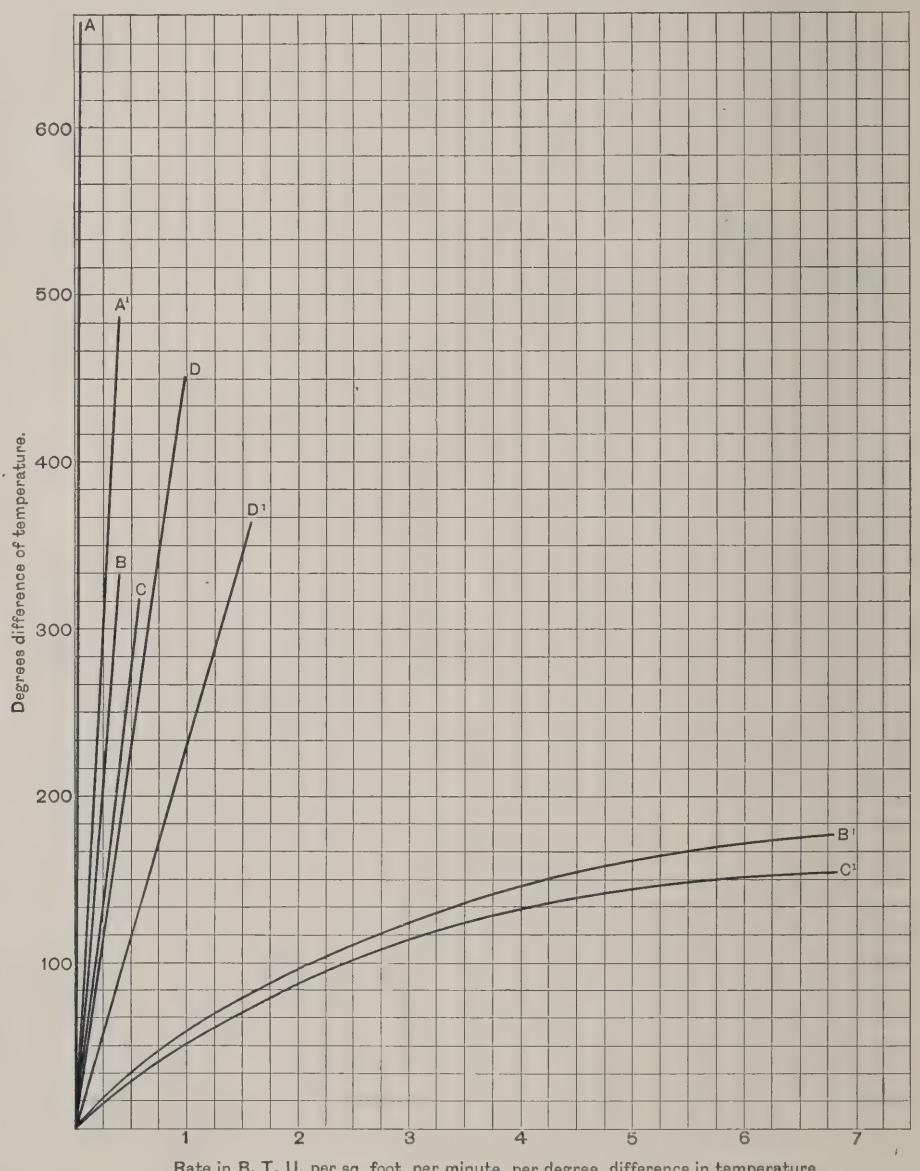
$$v = m\,a^{\theta}\,(a^{t} - 1)$$

where v = rate; m = a constant depending on the nature of the surface of the body; a = the number 10,077; θ = the temperature of the medium under the plate; t = the difference in temperature.

A,	from air	through	cast iron	and scale to water.
A^1,	" "	"	" "	"
B,	" steam	"	" " and scale	"
B^1,	" "	"	" "	"
C,	" "	"	boiler plate	and scale "
C^1,	" "	"	" "	"
D,	" oil	"	cast-iron	and scale "
D^1,	" "	"	" "	"

The results of the experiments are given in graphical form by the accompanying plate, all the curves being drawn to the same scale. The rate of transmission of heat in B. T. U. is plotted against the difference in temperature existing between the medium transmitting the heat and that by which it is finally received. All temperatures are given in Fahrenheit degrees. The medium receiving the heat was water, which was supplied at a constant temperature and discharged at some higher temperature, the mean of these two being taken as the true temperature.

Curve C^1 shows the rate of transmission of heat from steam at atmos-



pheric pressure, through a $\frac{5}{16}$ inch steel boiler plate, to water. The surface of the plate was left as it came from the mill; it was smooth and free from oil or grease.

C shows the rate for the same plate under the same conditions after a piece of carbonate scale $1\frac{1}{8}$ inches thick was placed above the steel plate. The under surface of the scale was smooth and in close contact with the plate; the upper surface was quite rough. The thickness was fairly uniform. In both cases the velocity of the steam below the plates was low, and its direction of flow was at right angles to that of the water above the plate.

B^1 shows the rate of heat transmission from steam at atmospheric pressure, through a $\frac{7}{16}$ inch cast-iron plate, to water. The plate was a good smooth casting, neither surface being finished, and both surfaces clean and free from oil or grease.

To get *B*, the same piece of scale used with the boiler-plate was placed above the cast-iron, other conditions remaining exactly as for B^1.

D^1 and *D*. Here the medium transmitting heatwas a bath of lard oil, the other conditions being as for B^1 and *B*.

A^1 and *A*. Again we have the same conditions except that we have a current of heated air transmitting heat to the cast-iron plate. The velocity of this air current was somewhat less at the lower temperatures than it was at those higher; but did not, in any case, exceed that common in the tubes of an ordinary steam boiler under natural draft. The direction of the air current was parallel to the plate and at right angles to that of the water above the plate.

The very great importance of the condition of the surface of the medium through which heat is transmitted cannot be too strongly emphasized. The equations of Newton and Peclet are indeterminate until the effect of the surface is known. This is well illustrated by two curves, not shown in the plate. The conditions were exactly the same as for *B:* from steam, through cast-iron plate, to water, except that there was a thin film of oil on the bottom of the plate. The readings were somewhat irregular, but the average loss in transmissive power was fully fifty per cent, the heat transmitted being much less than in case *B*, where the surface was clean.

The curves given represent the average result of several thousand observations, and we believe that they are fairly accurate. They show very clearly the comparative rate of heat transmission from steam, oil, and air, under the conditions here given.—Sibley Journal.

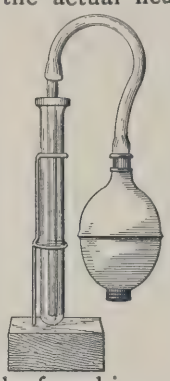
Inadequate Ventilation of Offices.

Dr. F. A. Adams, commenting on the prevalence of pneumonia among persons employed in steam heated office buildings in an article contributed to the Philadelphia Record, rightly suggests that the cause is found in the fact that in the large majority of cases no provision is made for the ventilation of the rooms in such buildings. He says that many of these buildings are admirably constructed to keep out air, whether cold or hot, this very perfection contributing to their insalubrity. In these hermetically sealed office rooms that abound in business buildings the steam heats the atmosphere to a delightfully comfortable degree, the occupant breathes and rebreathes the air during zero days when an open window cannot be endured, the effect being to silently undermine his powers of resistance, so that when he goes forth, exchanging such tropical air for the keen breeze of unrestricted nature, it happens that, through some subtle change in his system which has robbed his lungs of their power of resistance, their capacity to endure the onset or transition is gone, and the subtle poison of unrenewed air does its deadly work in the form of pneumonia.

A New Carbonometer.

BY W. MOLESWORTH, M.D.

I wish to invite the attention of the profession briefly to my new carbonometer for determining the excess of carbonic acid in the atmosphere in school rooms, sick rooms, hospitals, mines, tenement houses, etc., where absolute accuracy is not required. When the actual health of the occupants of any given apartment is taken into consideration there is no one thing of more importance than the quality of the air itself; and, recognizing the fact that there is no better test of its pollution than the per cent of carbonic acid which it contains, by aid of the carbonometer you can approximate the quantity near enough for ordinary use, and it should be found in every school room or other apartment subject to vitiation of its air.



Each apparatus consists of a glass test tube about five and a half inches long and nine-sixteenths of an inch in diameter, together with a smaller tube about six inches long, contracted about one inch from either end, with a valvular rubber bulb and tube to attach; also a rubber ring to fix its depth in the test tube, a wooden and wire stand for supporting it, with a small bottle each of lime water and vinegar, and a little brush for cleaning the test tube.

Fill the test tube for about one inch, up to the horizontal line, with a perfectly clear saturated solution of lime water; take the smaller tube with bulb attached, adjust the rubber ring so that it will hold the tube about three-eighths of an inch from the bottom of the test tube; gently compress the rubber bulb till all the air is expelled and then allow it to fill again with moderate rapidity, and so continue as often as desired. If, after filling and discharging the bulb six or eight times, the opacity of the lime water obscures the black spot on the base of the stand, the air is absolutely unfit to inhale; and if, after filling the bulb fifteen to twenty times the black spot is obscured, the observer looking downward from the top of the test tube through the lime water, the air is unfit for continuous respiration. In good air the spot ought not to be obscured in thirty or forty fillings of the bulb, and in pure air not at all. This instrument should be used in daylight, and the test tube washed out with the brush or otherwise after each observation. If incrustations of carbonate of lime form on the tube, remove with a little vinegar, after which wash thoroughly with pure water and wipe dry.

To obtain an idea of its workings, fill and discharge the bulb eight or ten times with the exhalation from your own lungs, and observe its action on the lime water.—Medical Record.

Gas for Fuel in Residences.*

BY DONALD M'DONALD.

One hundred cubic feet of natural gas weighs 4.287 pounds, is composed of 1.072 pounds of hydrogen and 3.215 pounds of carbon; it requires for its perfect combustion 969.3 cubic feet of air, weighing 74.561 pounds. It makes in burning 9.648 pounds of steam and 11.788 pounds of carbonic acid, equal to 100 cubic feet. It produces 94,593 heat units when the steam is not condensed. The total products of combustion are, therefore: steam, 9.648; carbonic acid, 11.788; nitrogen, 57.412; total, 78.848 pounds. If these products of combustion escape at a temperature of 600 degrees, they carry off with them 12,712 heat units, or about fourteen per cent of all the heat produced by the fire. If they escape at 300 degrees, they carry off less than seven per cent. Suppose, however, that for any reason twice as much air as is necessary to combustion passes through the fire and escapes up the chimney, along with these products of combustion, at a temperature of 600 degrees; we would then have a loss of heat units equal to 23,332, or about 26 per cent of all the heat produced by the fire. If three times as much air as is necessary for combustion be admitted and allowed to escape at 600 degrees, then the loss is 40 per cent.

It must be remembered, however, that with a wide open chimney and a strong draft not only is the volume of air which escapes up the chimney increased, but also the temperature is apt to be high. We find, therefore, that if a fire takes in five minutes as much air as is necessary, and that it escapes at a temperature of 800 degrees, then the loss will amount to 92 per cent of all the heat produced by the fire.

A room 16 by 16 by 12 contains about 3,000 cubic feet, and will require 2,177 heat units, in order to bring its temperature up from 30 to 70 degrees. If the combustion is perfect, and there is no other loss than that due to the actual products of combustion escaping at 300 degrees, such a room should be heated from 30 up to 70 degrees with a consumption of three feet of gas per hour; or assuming that the air is changed three times per hour, and that there is no loss through the walls or windows, nine feet of gas per hour should keep such a room warm.

* Abstract of paper read at the tenth annual meeting of the Ohio Gas Light Association.

NEW SPECIALTIES.

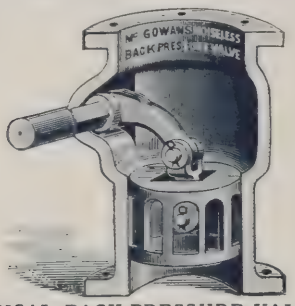
McGOWAN BACK-PRESSURE VALVE.

The noiseless back-pressure valve shown in vertical and horizontal forms by the accompanying cuts is manufactured by the John H. McGowan Co., Cincinnati, O., and is designed for utilizing exhaust steam from engines



HORIZONTAL BACK-PRESSURE VALVE.

for heating and other purposes. As shown, the lever on the horizontal valve is made of equal length on both ends so as to allow the valve to be placed in the position shown, or reversed, when the lever will be on the top side and the weight on the opposite end. The body of the valve is cylindrical, the lower end being bored, into which the piston with graduated side openings is fitted. The upper part of the case is enlarged to give free vent for the steam when the valve is open. When pressure accumulates sufficient to raise it the piston acts as in a dash pot and rises only until the graduated

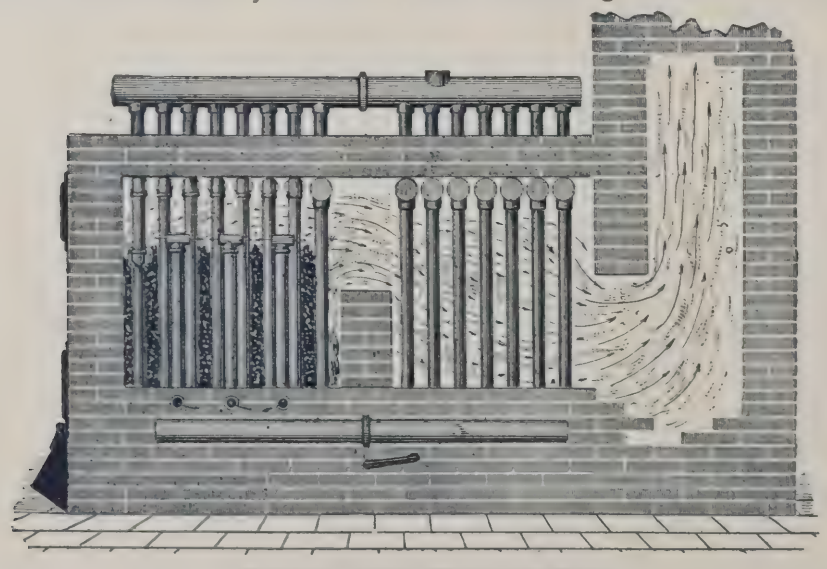


VERTICAL BACK-PRESSURE VALVE.

openings allow a sufficient escape of steam to prevent increase of pressure over that governed by the position of the weight attached to the lever.

PHELPS' IDEAL STEAM HEATER.

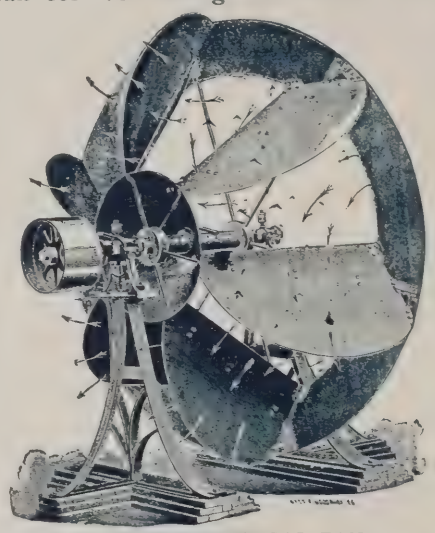
The accompanying illustration shows the construction and general arrangement of a heater made by the Ideal Heating Co. of Oskaloosa, Ia. The heater is adapted to use either hard or soft coal, coal slack, or wood, and is made in sizes ranging from five to fifty horsepower, with a capacity of from 250 to 4,500 feet of radiation. The pipes in the rear section are set in a staggered position, so that the largest possible amount of heat is extracted from the gases of combustion before they reach the chimney. All the joints in the heater are screw joints, and the entire heating surface is composed of wrought iron tubes so put in that any one of them can be cut out and a new one put in its place without disturbing any other pipe, with ordinary pipe working tools.



PHELPS' IDEAL STEAM HEATER.

SMITH CENTRIFUGAL FAN.

The accompanying cut shows a new fan for ventilating and other work

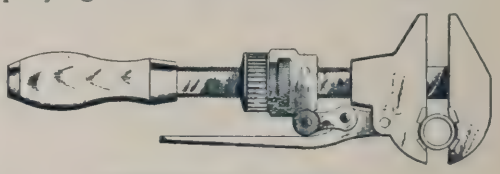


SMITH CENTRIFUGAL FAN.

which is a departure from the types of fans now in general use. The distinguishing feature of this fan is the combination of the cutting or wedge power with the centrifugal power which are found separately in the two general classes into which former types of fans may be divided. As the fan revolves, the inner edges of the blade have all the cutting power of any propeller fan while the angle of the blades to the shaft of 45 degrees gives the greatest effective length of cutting edge. The union of the cutting with the centrifugal power is such that when the fan is running in the reverse from its working direction the cutting force of the inclined blade almost exactly neutralizes the centrifugal, and there is no current either way. The Smith Heating & Ventilating Co., 53 State street, Boston, Mass., are the manufacturers.

HUMPHREY WRENCH.

The wrench shown by the accompanying cut is the invention of E. A.



HUMPHREY WRENCH.

Humphrey of Columbus, Pa., and, as shown, is a combination of an ordinary nut wrench with an adjustable device which adapts it for use as a pipe wrench. As will be noticed the sleeve nut is used only for adjusting the wrench to different sizes of pipes, the grasping and releasing being accomplished by means of the lever shown.

FURMAN JR. HOT WATER HEATER.

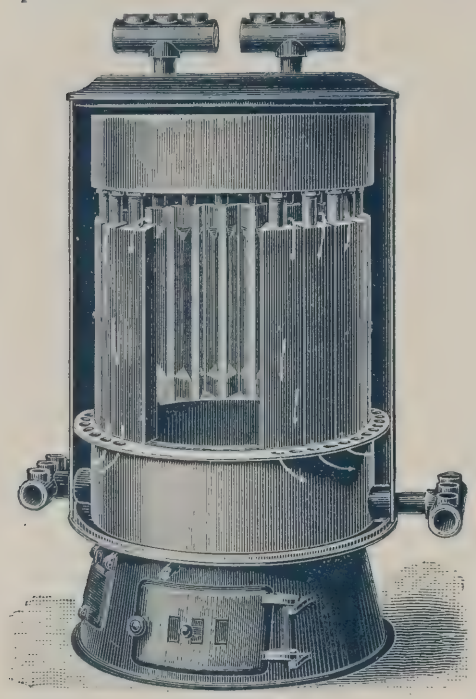
This heater is made conical in shape for the purpose of securing as effective and direct heating surface as possible. The corrugations on the interior of the fire box serve to overcome the chilling effect of the water directly against the fire, thus promoting combustion and doing away with the use of fire brick. The water section is cast in one piece. The boiler is simple in construction and does not require a skilled mechanic to set it up. It is adapted for use in small dwellings, conservatories, baptistries, barber shops, laundries, etc., and is made by the Herendeen Mfg. Co., Geneva, N. Y.



FURMAN JR. HOT WATER HEATER.

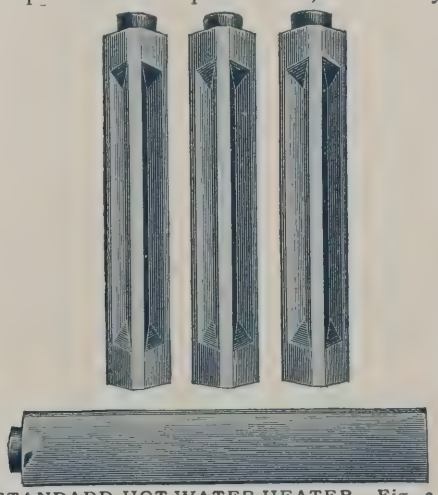
STANDARD HOT WATER HEATER.

This heater, with the exception of the nipples contained in it, is entirely of cast iron, and has no packed joints. Fig. 1 shows that the heater is composed of a number of vertical water



STANDARD HOT WATER HEATER.—Fig. 1.

sections which form a large combustion chamber. These sections have T-shaped surfaces, as shown in Fig. 2, and are connected by short nipples to the fire pot, to which they are screwed down tight, their upper ends being connected to the water reservoir which forms the crown sheet by nipples of sufficient length to permit the products of combustion to pass out and downward, as indicated by the arrows, in contact with the entire outer surface of the vertical sections and of the fire pot. The vertical position of the sections and the large heating surface which they present to the direct rays of the fire insures direct and rapid circulation. The tops of the sections are formed like hexagon shaped nuts, so that one or more of them may be easily removed and others inserted in case it is necessary. A perforated draft ring, which is placed between the casing and the boiler, on a line with the top of the fire pot serves, to evenly

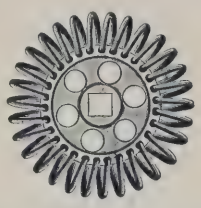


STANDARD HOT WATER HEATER.—Fig. 2.

distribute the products of combustion over the entire surface. Giblin & Co., Utica, N. Y., are the manufacturers.

PROUTY WIRE VALVE WHEEL.

As shown by the accompanying cut, this wheel consists of a metal hub surrounded by a coiled wire, the coils of which pass through holes in the outer edge of the hub. The coiled wire presents a good grasping surface for wet or greasy hands, and is always cool on account of the large amount of surface which it presents for the radiation of heat. There is no danger

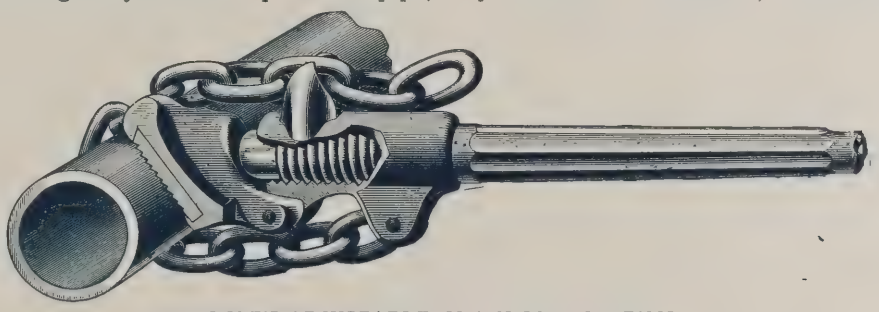


PROUTY WIRE VALVE WHEEL.

from warping and splitting off as is the case with wooden wheels. The wheels are made to fit all sizes, kinds, and different makes of valve. N. H. Prouty, Athol, Mass., is the inventor and manufacturer.

HILT'S ADJUSTABLE CHAIN PIPE WRENCH.

The slack of the chain of the wrench shown in the cut presented herewith is taken up by turning the handle and pushing the jaws close up to the pipe,



HILT'S ADJUSTABLE CHAIN PIPE WRENCH.

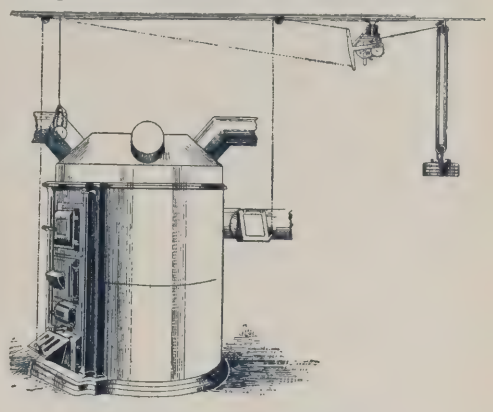
to any size of which it can readily be adjusted. Crushing is prevented by the manner in which the chain bears upon the jaw and is attached at long range on the under side of the body of the wrench. The wrench is very easily manipulated, and being simple in construction possesses durability. The Hilt's Wrench & Paper Cutter Co., Richford, N. Y., are the manufacturers.

GARDEN CITY CLASS "B" SECTIONAL HEATER.

The cut presented herewith shows one section of an upright heater for use with either live or exhaust steam or both in connection with hot blast heating. It is made of one-inch steel pipe vertically arranged in a cast iron base in a staggered position so that the air in its passage utilizes all the exposed radiating surface. The supply and drain are placed on the same end of the base, and are designed for connection to one main supply and drain from a manifold, provision being made for cutting out any one section without interfering with the rest of the heater. The construction of the new heater is similar to that of the standard heater made by the same manufacturers, Garden City Fan Co., Chicago, Ill., few steam joints being a special feature.

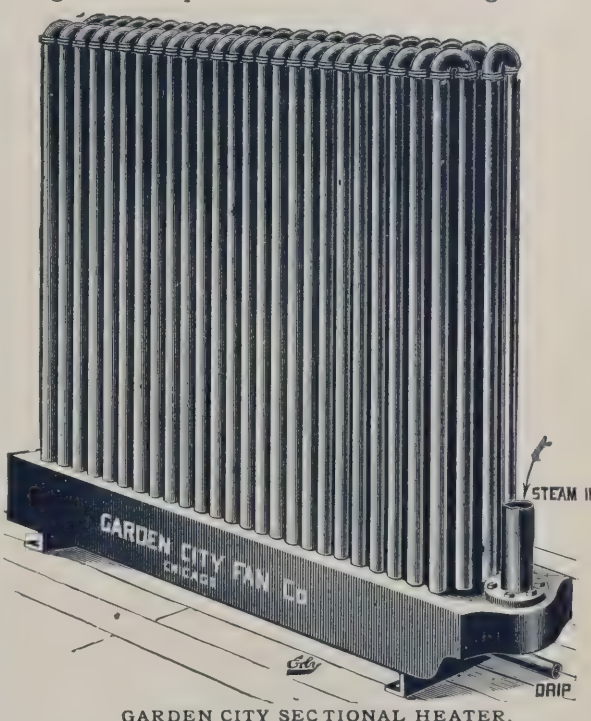
MORSE HEAT REGULATOR.

In this regulator, the application of which is shown by the accompanying cut, a thermostat centrally located in the apartments to be heated controls an



MORSE HEAT REGULATOR.

electro-mechanical appliance which automatically operates the dampers of the heater, thereby maintaining an even temperature. The thermostat can be set for any degree of heat by turning a thumb screw which carries a graded disk to the degree desired. A second thermostat, uninfluenced by external conditions, closes the damper as soon as the fire comes up to the point of perfect combustion, thereby stopping the unnecessary consumption of coal and utilizing the



GARDEN CITY SECTIONAL HEATER.

heat which would otherwise escape up the chimney. W. V. Whipple, agent, 17 Milk street, Boston, Mass.

Heating and Ventilation

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When a journal, published in the interest of a trade, secures advertising patronage because it spends a great deal of money to make each issue of interest and of value, and gives its advertisers good returns for money invested, such a transaction is legitimate; but when a manufacturer is solicited for advertising in a program, a catalogue, or a souvenir, and threats of boycotting are indulged in by the solicitor in case he does not "come in" and put up $50, such transactions are *not* strictly "business." Under ordinary circumstances a reasonable amount of business may be obtained on a straightforward basis, but the attempt to secure advertising patronage on any other than a straightforward basis should be discouraged.

Advertising indicates liberality and breadth of view in business matters, but the advertiser who gives out his contracts promiscuously and spends a great deal of money for advertising space which he knows to be of doubtful value should not forget to note in his ledger that his money was "spent for charitable purposes" instead of for legitimate advertising.

Money properly expended in trade-paper advertising is beyond question the most profitable investment a manufacturer can make. It indicates his faith in his own goods and prices and his ability to meet competition. It shows a desire for trade, and it is both advantageous and agreeable to deal with those not indifferent about securing your patronage. It exhibits a desire to build up and maintain a reputation for the goods advertised. Strong competition in the heating field, as in others, has made it necessary not only that the apparatus manufactured shall be first-class but that it shall be intelligently and actively brought before its special line of customers through mediums best suited to the purpose.

Economy secured by the use of high pressure steam for heating as well as power purposes, is a subject that seems to have received but little of the consideration to which it is entitled. It has been stated that steam at 150 pounds pressure costs less than 1 per cent more in coal, and is a gain of 33 per cent in power over steam at 100 pounds pressure; and in this connection we would call attention to the advantages of using high pressure steam which are pointed out in an article on another page treating of the water tube boiler.

Tables such as are published in connection with the above mentioned article, showing the space occupied by plants of shell boilers and by plants of water tube boilers of corresponding power, have not, to our knowledge, ever before been published. The comparison is an interesting one and develops facts of which engineers and architects should be careful to make note for future reference.

From a western heating engineer we have received a copy of what purports to be a bill providing for the proper construction of schools and for the ventilation thereof. As the legislation proposed, if enacted into law by so prominent a state as Illinois, would be quite interesting to the heating trade, we venture to express our opinion that its provisions are decidedly crude where they are not positively bad.

We can see no good reason, for instance, why a school house more than one story high should not be built of wood, provided a community can not afford to erect one of brick or stone (which the bill calls for) with the required accommodations. Neither do we see any reason for limiting the height of a school to two stories, as provided in the bill. This would have prevented the erection of many schools now accepted as models. To be sure, it is well to keep the regular class rooms below the third floor, but for laboratories, lecture rooms, drawing rooms, cooking schools, gymnasiums, and many other purposes, the third floor offers valuable space at little cost.

The requirement that two flights of stairs, "one for boys, the other for girls," should be made compulsory, shows the crudity of the bill as drafted. Cannot the boys come down the girls' stairs in case of fire, and must the teachers drop out of the windows because they are neither "girls" nor "boys," but men or women? The provision that the schoolroom should be "narrow from left to right" might be difficult to enforce, for some architects would be sure to make it narrow from right to left, and no one could tell the difference.

Under the head of Ventilation and Heating is a requirement that the air should be admitted into the school room eight feet above the floor and exhausted at the floor line and should not come from underground ducts, and should not be less in quantity than thirty cubic feet per minute for each pupil. We cannot see why a distance from the floor of seven feet or twelve feet is not as good as eight for the admission of fresh air, while we believe the exhaust should often be from near the ceiling, as in summer, rather than from near the floor.

Massachusetts has proven the beneficent effect of legislation concerning school construction, but has done it in a negative rather than a positive manner by prescribing not what shall be, but what shall *not* be done. In that state the supervision of school construction is by state inspectors. The laws work very well, and check improper or extravagant orders from the inspectors by making local boards of health the final power in case of appeal.

Inspectors' duties should be clearly defined to apply only to *results* in ventilation and not to the *methods* of obtaining them. Otherwise the inspectors are all the while open to suspicion of favoritism, and free to levy a species of blackmail if they happen to be so disposed.

Proceedings of the Sixth Annual Convention of the Master Steam and Hot Water Fitters' Association of the United States, held at New York, June 19 to 22, 1894.

The Sixth Annual Meeting of the Master Steam and Hot Water Fitters' Association of the United States was held at the Broadway Central Hotel, New York, June 19, 20, 21 and 22.

The meeting was well attended both by members and by the manufacturers who wished to cultivate their acquaintance. The meeting was unusually interesting, and a large number of practical papers were presented. Special mention should be made of the paper by Mr. Nesbit of London, England, and that of A. C. Walworth of Boston, the complete texts of which will be found in other columns. Important measures affecting the management and conduct of the Association were adopted, and much advancement is looked for in the coming year.

The parlors, basement, and hallways of the hotel were continually crowded by those interested in the exhibits of the different manufacturers. A large number of boilers, radiators, fittings and tools were shown, the steam fitters highly appreciating the attractive display.

With their usual liberality the manufacturers entertained the delegates, their ladies and friends with numerous carriage drives, theatre parties and excursions, and the utmost harmony and good feeling prevailed from the opening to the close.

At 11.20 A.M. Tuesday President Rutzler called the convention to order.

On motion the calling of the roll and the reading of the minutes of the previous meeting were omitted. The president then appointed the following committee on credentials: J. E. Kenrick of Boston, chairman, E. D. Smith of New York, C. H. Simmons of Chicago and W. P. Thompson of Philadelphia. To allow the committee time in which to examine the credentials of the members the convention adjourned until 2 P.M.

AFTERNOON SESSION.

The first business before the meeting at the afternoon session was the reading of the

REPORT OF E. RUTZLER, PRESIDENT.

GENTLEMEN AND FELLOW MEMBERS OF THE MASTER STEAM AND HOT WATER FITTERS' ASSOCIATION OF THE UNITED STATES.

I congratulate you on this, our sixth annual convention, that, after the financial and general commercial strain and universal lack of business covering the whole of the United States for the past year, there are enough of us left to make so fine a showing at this meeting. The position of the officers of the association for 1893-94 can perhaps be justly compared to that of men in the divers lines of business in our country, which is summed up in a few words of but little to do and an insufficiency of funds to do that little with.

Perhaps it is fortunate for me that my term of presidency should have fallen at a time when there has been so few demands upon us. To have accomplished so little in an ordinary year would be embarrassing indeed, but under the depressed circumstances through which our country has passed I am confident that you, as fair minded men, could not have expected very much.

On behalf of the New York Local Association I welcome you to our city, and we earnestly hope that your short stay with us will be pleasant and profitable to yourselves and beneficial to this organization. You will find the members here not only willing but anxious to aid you in every manner possible to make your visit comfortable and satisfactory, and one long to be remembered. We therefore specially request that you do not hesitate to make known your requirements and desires at any and all times to the Local Association,—individually or collectively.

It would have been our pleasure to report to you a largely increased membership, but circumstances and times familiar to you all have robbed us of any such privileges. It is not necessary to refer to these in detail.

Our secretary has made a few trips, and has issued some important confidential circulars, endeavoring to arouse an interest in association affairs, and thus increase our numbers. Of this he will give the particulars in his report.

In view of the fact that there has been some criticism upon our committee because of the dates of our convention occurring at the same time as those of the Master Plumbers, it is due to ourselves and those not familiar with the steps taken, that I make clear to you the manner in which our annual meeting was arranged.

At an executive committee meeting on January 30th the matter of our convention was brought up, and after considerable discussion the committee decided, on account of the summer resorts not opening uniformly until the 15th of June, to defer it until after that date, hence the 19th, 20th, and 21st of this month were decided upon. It was further decided at that meeting that if the appointments at the Broadway Central were suitable, and the proprietor was willing to accommodate us, the prices, etc., being satisfactory, we would look no further. Our secretary was instructed to see Mr. Haynes, the owner, and arrange upon these conditions and report to the committee at the earliest practicable moment.

The secretary called at the Broadway Central Hotel the same day and learned that Mr. Haynes would not be in the city for about a week. As soon as he returned the proposition was made to him, and he expressed not only willingness, but a desire to have us convene here.

The committee were then invited by telephone to meet at the Broadway Central Hotel and examine for themselves. At that meeting (everything being satisfactory) they decided to hold the convention on the dates named, provided the Master Plumbers had not yet chosen days for their annual gathering with which ours might conflict. This Mr. Reynolds was directed to ascertain. On the 10th of February he did so by calling at the office of the Plumbers' Trade Journal. Notice of his visit on the 10th will be found in their issue of the 15th of February. He was informed there that their date had not been fixed, and he then announced to the Plumbers' Trade Journal people that we would hold our convention on the 19th, 20th, and 21st days of June.

From there he went to the office of HEATING AND VENTILATION and stated to them that our time had been settled upon, naming the date. This was on Saturday afternoon, the 10th of February.

The following Monday, the 12th, general notice was sent from the national headquarters to the various trade papers. You will see by this that we took all precaution not to announce our date until we knew that the plumbers had not made theirs. If they had taken like pains to inform themselves there would have been no conflict. Thus it is apparent that the Master Fitters are not responsible for this unfortunate circumstance.

You are all familiar with the action taken at our last annual meeting in the matter of standard flanges, adopted as reported by our committee. Manufacturers have since suggested a few changes. This question was brought to the attention of the executive committee and myself, further mention of which will be made in the secretary's report.

Our committee on standard flanges is still in existence. In my opinion this question should be referred to them again, that they may specially consider the changes recommended, perhaps in conjunction with a committee of manufacturers, or at least such manufacturers as are present or have representatives here. I am convinced that standard flanges is a long stride in the right direction in our interest and that of our patrons, and of the manufacturers as well. The ground of all these desirable features was so thoroughly covered in the discussion at our last convention that it is not necessary for me to bring them to your attention at this time any further than to say that letters received in answer to the pamphlets issued embodying the action showed a hearty approval on the part of the manufacturers.

It would be well, however, that we consider at this meeting what the percentage of inquiry by steam fitters has been for standard flanges, and how far they are endeavoring to use them in their work. You will remember that so far as was practicable we were to use in our business nothing but standard flanges after January first of the present year. One manufacturer, to my knowledge, has already made the necessary changes and is ready to supply the standards adopted. How extensively this has been done, or how many firms are thus equipped, is more than I have been advised of.

I am led to say that I never so fully realized the respect in which this association is held by the supply trade as I have since holding the position of president. I had always underrated our worth as an organization before, and I believe every member to-day who has not held office in it is undervaluing our strength. I think there are few, if any, manufacturers who are unwilling to extend to us what is our due. It is my opinion, too, that on account of the want of a full realization of how others look upon us, and with the uncertain value we place upon the organization ourselves, results are minimized and our effectiveness seriously impaired.

I have but little patience with those who claim that we do not need a national association, and that we can take care of ourselves through our Locals. Is it possible that we must suffer the experience of an object lesson to convince many to the contrary? For my part I hope not. I fear it would be too much like a man trying to demonstrate by practice that he could afford to do without fire insurance and during the time of his object lesson be burned out and lose everything. Under such circumstances, what has he to do? He would simply have, with his prestige added, to begin his business life over again. Do we want to try that? I say No. It would be taking a step backwards. A man might as well try to convince me that state militia can create the same respect that our National army can as to tell me that locals can take care of themselves and the country in the absence of our National Association; and when the latter is allowed to die we shall accomplish just about as much nationally through the locals as we would in a national contest through militia where each state was pulling, as it would naturally do, in its own home interests. To be effective the state militias would have to be combined under one common head and act in a single direction. and in a like manner, in my opinion, our locals have got to sustain this national association if they meet with any marked success.

Our secretary once compared our association to the red signals used upon railroads as a preventive of destruction. The manufacturer and seller of goods is constantly respecting this organization in a manner similar to that in which railroad employees regard the red signal, recognizing that each designates limits beyond which it is not prudent to go. There would be just as much consistency in members of this order recommending an abandonment of it because it had not done enough in the way of restoring and improving, as there would be in a railroad company discarding the red signal because it was powerless to repair, when in fact its only value was in preventing disaster.

The chief and essential object of our craft to-day is to prevent encroachment upon our rights. That our national association surely does, which we shall learn to our sorrow if it ever becomes extinct.

We have spent four years now, and I might say five, in trying to induce men who do a small amount of heating in connection with some other business to identify themselves with us and have our assistance in removing obstacles that are in their way. The question arises with me now, is it not better that we band together, as we should in the larger cities, and say we are going to take care of this association, leaving it with these outside parties to come with us if they want to, meeting them nine-tenths of the way when they offer to come, and do them all the good we can, but not hunt for them any more? Our lowest rate is $10 per year; it is barely possible that it might be made $5, but I do not believe if it were these men would do more than talk. They would rather keep that $5 than come into the association, and by some healthy method in the localities where they are doing business benefit themselves to the amount of $500. The National office has been filled with letters for the past two or three years wherein men state they cannot put a price upon their work because the consumer can get goods first hand.

I say this is purely the fault of men in localities where such transactions takes place. I do not think they could do very much by themselves, but if they will join together and become members of this organization we can benefit them and stop such conditions. I know of one small city where all the letters we have had this year have been encouraging—not one complaint. They pay their dues promptly, and are acting in a fair and honest way toward each other. They originally simply sent out letters to the supply trade stating that they belonged to the national association, and I am confident they have had nothing to complain of in the way of violations. Their secretary writes that although they have not done one-third the work they did the year before, their profits have been greater.

There is another subject that I wish to call your attention to, and that is: the contracting for work and guaranteeing a temperature of 70 degrees Fahrenheit in zero weather. I think a committee should be appointed to recommend, if possible, a remedy for this complication.

Some of our members have been from time to time in correspondence with the Engineering Record paper on this subject, and this journal, while it strives to be neutral as between the architect, contractor, and owner, holds that if an architect or owner puts out a plan and specification calling for the quantity of radiating surface, size of boiler, piping, etc., they should not ask you to guarantee as satisfactory to them in every particular that which they compel you to furnish, and in some cases cause you to wait for the last payment possibly from one to ten years, or until Providence comes to your relief by furnishing a zero temperature; and then if you should have to change some radiator by substituting a larger one you would have to wait until Providence again came to your relief before you could get your final settlement.

When an architect makes his plans for a building he states what kind of a foundation he wishes for the walls, how thick they shall be and the size of the beams and trusses, and he assumes the responsibility for them, which is no more than he should do, as that is what he is employed and paid for by the owner. In the same way, if an architect employs an expert to make his plans and write the specifications for steam or water heating apparatus, he should hold that expert responsible for the work he has done. I have had but one case in the twenty years (and over) that I have been in business where they have attempted to hold back my last payment for the zero test, and that has been within the last two years, but I find the tendency is growing to take advantage of every little technicality in our contracts to withhold our money.

I call this matter to your attention believing that steps should be taken at once that will prevent any further encroachment upon our rights in this direction. We must not forget that we are nearly always the last contractors to complete our work, and if the party from whom we have taken our contract should run short of funds after he has paid all others, we have to wait until he gets good and ready to settle, with the possibility of losing the final payment, or a portion of it entirely. We should not allow our anxiety to close a contract to lead us into accepting conditions that in many instances result in a loss on the work performed. Such contingencies can only be avoided through regulations and agreements among ourselves, through our local and national associations. The grievance cited here is one that I think our whole country is afflicted with, and therefore the special necessity of national action upon it.

For the honor which you conferred upon me at our last convention by electing me to the office of president, I wish to earnestly thank you, and to attest that the duties have been pleasant as well as beneficial to me as a member.

The executive committee have aided me all that I could possibly ask. They have responded when called upon by me in a most cheerful manner, and have always attended the meetings. I wish especially to thank them for the support they have given me. I wish, also, to extend my thanks to our secretary and his assistant for the faithful manner in which they have attended to their duties, and I hope that the labor performed at this meeting will be of so wise a character that all will be benefited and that it will cement us closer together, and I bespeak for my successor the same courtesies that you have all extended to me.

REPORT OF SECRETARY GEORGE H. REYNOLDS.

For the sixth time in the history of this association I place before you a review of a year's work, with a comment or two added.

As usual, the first few weeks were consumed in moving, installing ourselves in new headquarters, and sending forth matter mapped out by the annual meeting. A mimeograph copy of the reso-

lution of the committee on manufacturers and jobbers was distributed very soon after our arrival in New York, as directed by the convention. This resolution you will remember reads as follows: "Your committee respectfully recommend that manufacturers and jobbers be requested not to sell goods to the consumer except to those who are already exempted by our former national consumers' discount sheet."

Pamphlets containing recommendation of the committee on standardization of flanges, and the action of the convention in the matter, were printed at the earliest possible moment and placed in the hands of all steam fitters and manufacturers throughout the United States.

The letters called forth by this pamphlet were numerous, and were unanimous in the sentiment that the step was an important and well-considered one from all points of view.

Some of the manufacturers were of the opinion that several of the diameters recommended could be improved upon, and at the request of a few of them a call was issued for an executive committee meeting, and President Rutzler invited Mr. Carlton W. Nason, Chairman of the Committee of Mechanical Engineers on standardization, to be present. A protracted session resulted, and it was the conclusion that the committee had better abide by the decision of the annual meeting, especially as the scale of standards had been placed in the hands of those concerned, leaving it with the manufacturers to come together and change such sizes as they deemed best. The matter was not again referred to until December, when we received a call from Mr. E. P. Bates, chairman of your committee on standardization. He stated that he had been requested to recommend the following alterations: "That the 3½ and 4 inch flanges be changed from four bolts to eight, the bolt holes being made ½ inch in diameter instead of ⅝."

The advisability of the committee's acting upon this was considered at length, and it was decided that they were not at liberty to do so, and thus the subject rests.

OSBORNE SUITS.

Referring to the suits of the Osborne Engineering Co., you have no doubt all learned of the decision in favor of F. W. Lamb & Co. of Chicago, in the case he was defending. Only one prosecution to our knowledge has been undertaken since our last annual gathering, viz., against Mr. James Curran of New York city. The chairman of the defense committee, Mr. E. P. Bates, will undoubtedly lay before you the present status of this case.

SOUVENIR.

Our Souvenir this year is still fresh in the minds of you all, as it was mailed to each in January last. This matter was delayed for months in our efforts to secure advertisements sufficient to pay for the publishing. For causes well known to you, business men have not been doing their usual amount of advertising, and we therefore, by order of the convention, had to face the probability of losing money on the publication. By the suggestion of an ingenious member of the executive committee this was averted, and advertisements enough were secured to cover expenses and leave a small margin to the association's credit.

In considering the advisability of publishing the annual proceedings this year, the committee decided that in face of the uncertainty of the times it would not be prudent to contract for an expenditure of from $1,200 to $1,500 by the association. Hence the question of issuing a Souvenir of this convention is left for you at this meeting to determine.

CONSTITUTION AND BY-LAWS.

Our Constitution and By-Laws have been reprinted with the changes adopted at our last annual meeting, and each of you hold a copy of the new edition.

LOCALS.

Reports from the various locals all through the year have not been very encouraging, but this is not surprising, taking into consideration the state of business generally and the limited amount of building undertaken in many localities.

TRAVELS.

As to my travels this year, and my efforts to form new locals, I have very little comment to make. I have undertaken several short trips, but they have not been productive of much good, at least the results are not yet visible. There has been but little to warrant venturing the expense of traveling and seeking to increase our strength since our last annual meeting.

I was advised by one of our members that firms in New Haven, Conn., were anxious to come into the fold and do something for themselves. Upon this information I made a visit there but could not succeed in getting them together at that time. I planned with one of the firms to arrange a meeting at a later day and advise me. This he undertook to do, but the report from him was that he did not meet with any success.

Two trips to Paterson, N. J., showed about the same results.

Mr. William P. Thompson, of Philadelphia, has been earnestly working the whole year to revive the local in that city, and recently has been holding meetings with some promise of success. Mr. Thompson will be here to report what encouragement he has met with.

I have made four trips to Philadelphia since the headquarters have been in New York city, and I can assure you they are in something the same condition there that the city of Boston was in at the time of my first visit. All I can say is, if they were thoroughly organized with a view to making the situation as bad as possible it could not be any worse than it is.

On April 5th I started on a journey west. I first went to Cincinnati, where I think I accomplished some good; at least, we have recently received very favorable reports from there, which we hope will be verified at this meeting. From there I went to Chicago, where I found contracting employers of labor in all lines in a siege with their men, and there was no prospect of diverting the minds of our people from that issue. It is indeed a sorry day for organizations when Chicago men, with their experience, need any urging in association affairs.

Prior to leaving New York I had written St. Paul and Milwaukee inquiring if I could do any good by going there, and requesting them to reply to me at Chicago. Their answers were that they would be glad to see me but they did not think I could be of any benefit. The one from St. Paul indicated that nothing could be done for them at the present time.

This is attributable largely to the financial condition of the country, there being really no prospect of work except perhaps to a limited extent. The letters from Milwaukee set forth that their local was in good condition, with an increased membership, but had not a very flattering prospect of business, and they urged for lower dues, etc., which they have since reduced.

From Chicago I went to St. Louis, where the men for a long term of years have failed to accomplish very much towards sustaining each other or their business as a whole. I could not remain there longer than two days, and I think from reports since my return that I did them some permanent good.

From St. Louis I visited Cleveland, where I found a grievance that was slightly uniqne. I will explain this in private conversation only. I did what I could during my short stay there to convince those I saw that the division existing between them was destructive in the extreme. We have late information that they have reorganized on somewhat new lines and that they will be represented at this meeting. Certainly this is encouraging, and we hope they will be here to speak for themselves.

I have also had quite an experience this year through writing some 300 personal circular letters to various cities, pointing out the necessity of men affiliating and working in harmony with each other, the only method by which firms can secure their rights and obtain that measure of respect that is due them by the supplyers of material.

I have offered by correspondence to visit such cities, provided they would confer with each other and agree to act together.

In this effort I have not been successful. Each locality seems to possess a man with some sort of special affliction. One is to be very just (that is, in his own mind). He looks so particularly to the interests of his customer that he is willing to make any amount of sacrifice for him, when, in truth, this same customer is earnestly endeavoring to get his work done a little below the actual cost. Any slaughter he can force upon his competitor that adds to his attitude of honor in the eyes of his patron fufills his conception of justice. I suppose it is asking and expecting too much that an individual can be truly just with his competitors. It is unnatural, but experience teaches me that any man who studies to build up a fraternity of which he is one is building well for himself. Nearly every impediment he places in the way of others in his line will prove an obstacle that sooner or later will come home to plague him.

Another hindrance met with is, a firm writes back that they are thoroughly satisfied with their business; they do nine-tenths of the work; they get good profits, and all that. It seems that such abundant success would occasionally prompt some one at least of these many firms to retire upon their accumulations and take the world easy. Not learning of any instances of this kind slightly confounds me, and the inquiry naturally comes, do they not look upon a large volume of business done as success with an emphatic indifference as to the profits made? It is a question with me whether such men do not intend later on by an invisible pressure of some sort to extinguish their competitors and get the other one-tenth of the work.

Some three years ago, when claiming to a body of steam fitters that they were not making the amount of money they should, one of the parties spoke up and said with much emphasis that he was doing elegantly well, was getting all kinds of good prices, and had about as much work as he could do, and appeared incensed at what I had said. If we had been more thoroughly acquainted I should have taken issue with him then and there, for I knew his claim was not true, even though he might have thought it was, and neither is it true to this day. I took some pains to make inquiry at the time, and learned that his business was not profitable as looked upon by others, and if my opinion was asked at this moment I would have to say from late information that his condition now must be an uncomfortable one.

You can picture to yourselves just how this party looked to me and to others present while making that statement. I wish no steam fitter in this country, until the situation looks more favorable than it does now, or ever has, would make that claim to me again. I am practically silenced, as I can say nothing back without giving offense. I positively do know that there is no single firm in the United States so preferred that the facts will justify any such assertions. I ask in all fairness if you do not feel a slight wave of derision pass over your face when any contracting steam fitter claims that he is doing all the work he cares to and that the prices are abundantly satisfactory? The open competition for work to-day positively forbids any such salutary results. Therefore he must be wrong, for he cannot achieve the impossible. It is very aggravating to meet any such single individual and have all your efforts destroyed when you are trying to benefit some given city where all the others interested are doing everything they can to aid you, which has been the case with me several times since my connection with this organization. I believe we have a right to distrust the man who cannot find it possible to make some kind of amicable living arrangements with his neighbors.

A man who will claim that he is satisfied with the business strife he is in now is one not to be disturbed by the fact shown by statistics that over 95 per cent of our business men are unsuccessful; and whether he so intends or not, his attitude savors of a willingness to aid in swelling the ratio of failures to still more distressing proportions. Can it be possible that such a man has a heart? I suppose we must admit that he has, but we have a right to ask, does he ever commune with it? He might as well buy a lottery ticket, positively assuring himself that he will draw the capital prize, as to think he can escape being listed with the great majority that make up this lamentable business history of failures.

I am endeavoring to speak to you plainly, and not with a view to making any friends by so doing, either. I am trying to pave a smooth and easy way for some secretary who will be inclined to pat you on the back. In justice to all, however, I wish to add that there are very few of this stamp, and if they were located all in one city they would do but little harm, for such a special locality could be very conveniently passed by.

Returning again to the volume of business done, you must all agree that it does not require talent, commercial ability, or commercial integrity to give goods away. A man without experience, and one who would check up a minus "net" in every business qualification could do that.

Again, the remark has been made, and men have written letters stating that they would not belong to any organization because they did not propose to be dictated to in their business. What a thought! A man in the open market to-day proclaiming that he does not propose to be dictated to, when in fact if he is ambitious and energetic he is fairly crazed with dictation, and of a violent and malignant character too. Every move his competitor makes, every leaf he turns, every step he takes, dictates to such a party what course he must follow if he hopes to turn him down, which it is the pride of his life to do. How can such a man claim that he will not be dictated to when he has to follow closely lines laid down by his competitor for him to travel in. Whichever way he turns he sees his success threatened, and he is in one continuous and unceasing struggle for commercial existence. Why? Because those whom he desires most to defeat are constantly dictating to him by submitting prices and conditions that he must meet if he expects to do any work.

Business associations and organizations are for the purpose of modifying dictation, to modify all the agencies that lead up to strife, for healing wounds and for laying aside the keen edged instruments that cause them. Any man who claims that he cannot belong to an association in his line of business because it dictates to him is wonderfully hoodwinked as to what true dictation is. The only man who is exempt to-day is he who owns in every way a valid United States patent on some valuable commercial commodity.

Until men do act together harmoniously, and as they should, they cannot and will not receive the respect that is due them from the suppliers of material.

RATE OF DUES.

We are in receipt of communications from the states of Kansas and Michigan, bearing upon the question of dues in this association.

Evidently a reduction of dues to meet the conditions as pointed out in the letters just read, while it would increase the membership would lessen the yearly receipts, and there is no doubt but by reducing your secretary's salary the association can be run on a very much more economical basis, and the organization, through the increased membership, be much more effective than it has in the past.

The constant claim by members that the ratio of benefits is not proportionate with the cost of maintaining the order is harmful beyond measure. The value of the association will always be measured by the position each member assumes when contracting for his supplies and the conversation he holds with solicitors generally, and if he feels that his investment in dues is entirely out of proportion to his returns there will be that indifference in his attitude towards the seller that the latter can safely say to himself and his firm, "We do not need to respect the requests or expectations of the master steam fitters' organization."

A member of this association admitting to a seller of goods that it did not amount to very much would only be equal in results in his own interest to telling a customer while urging for his contract that he did not expect to do him a very good job. I have had a man representing one of the chief firms in the United States, in the presence of a manufacturer of steam heating supplies, take such a position and ask me to explain what good the association had done. The remarkable feature in this discussion was that while the member was trying to convince himself that the organization was of no avail the manufacturer was arguing that it had been and is a benefit. Does that not demonstrate that the manufacturer was showing due respect to this association? Surely it can never amount to very much if many members assume the attitude this one did.

One thing is evident, and that is, if the association is of no benefit his own personal conduct, if indulged in by many others, is sufficient answer as to the reason why. From his standpoint, and the kind of a soldier he is, the organization must necessarily perish, and when it has perished, and trade becomes thoroughly demoralized, as it surely will, I suppose he will then have the assurance to tell us it was on account of the previous misrule and bad administration of association affairs.

I wish to make a suggestion to the critic of this organization, and to do that I want to present it in the light of a question or two.

I beg to ask him first, has he ever devoted one-tenth of the time to searching within himself for something to benefit the order that he has for a point to criticise? I do not believe there is a single critic who has given any time whatever to a thought of how he could help himself through benefiting the association. The fear of doing something to help anybody else usually prevents a man of this character from taking any such steps.

Again, I ask each critic to study and resolve that in the future he is going to make just as great an effort in the interest of the organization as he is to find something to pick a flaw with or complain of, for by so doing he is helping his own affairs. I have reminded you before of the old adage that a good critic is one who has something better to recommend. Then what have we to say of the one who has nothing to offer?

I have also called to your attention before (which is only too true) that one faultfinder and general grumbler can in a short period do more harm than forty good, loyal, patriotic, broadminded and broad-souled men can repair in forty times the same space in minutes and hours.

COMPLAINTS.

A few complaints of firms who have not lived up to Article XVIII of our Constitution, and notified members in other towns of intention to bid in their territory, have been received and in each case promptly attended to and mutual satisfaction established.

With a view to minimizing infractions of this kind, President Rutzler issued a circular letter the latter part of the year, which was sent to each member, calling his attention to this article, which you are all familiar with, having lately received the communication.

This article has served a splendid purpose in cementing you closer together, and each instance in which it has proved faulty has been offset by several where it has been a material benefit. This clause can be so manipulated in practice as to easily remedy any objection that can be charged to it.

A few complaints of sellers of goods violating their agreement with the steam fitters have also reached us, but in no case was national interference required, the supply men manifesting a deep interest in satisfying grievances rather than have them called to the attention of the National Association, which argues more than you are liable to appreciate for it.

I will add, however, that there is one case of violation in the hands of the executive committee now. This has been referred back to the locality where it occurred for investigation. Possibly, it being a matter under consideration, there should have been no reference whatever to it at the present time.

DISCOUNT SHEET.

Referring to the resolution passed at our last convention recommending that manufacturers and jobbers be requested not to sell goods to the consumer except to those who were already exempted by our former national discount sheet, it is proper to report that so far as my observation has gone this resolution has not had the slightest consideration from either the sellers of goods or our members. The measure of disrespect it has received from all directions is sufficient to teach that no possible good can accrue to your association from this policy or any other wherein the manufacturer or jobber is expected not to sell to the consumer. The only thing that has been of any avail in that line was the original discount sheet, which it is undoubtedly safe now to again reinstate, but on slightly different lines.

The storm created by the circular relative to it (that was issued in 1892) has now blown over, and experience has taught that it would have been wiser to couch it in milder language; and had this been done, beyond a doubt there would have been no sharp criticism upon it. The fault of the wording of the circular you can attribute to me. I am not willing, however, that you should charge I am not ready to learn from experience.

Personally I am of the opinion, based upon close observation, that much more can be accomplished through appealing to the sellers of goods than by demanding. No firm in the United States can successfully cover up a method of selling to the consumer at trade prices. It will get into the atmosphere in spite of them, and they cannot escape the odium that will positively follow, provided you maintain your organization and keep any recorded data of this character.

HOT WATER BOILERS.

We have had some letters relative to the hot water boiler plague during the year, and in addition to this I have held conversations from time to time with a few in that line with reference to the disagreeable features in connection with the present practice. I have endeavored to induce one very competent gentleman who has had a large experience in handling boilers with the trade to write an article upon the subject. I hoped at one time he would do so, but later on he informed me he was too busy. I am inclined to think it is a question he felt more like giving up than attempting to recommend a remedy for, feeling possibly that he could not do the situation full justice. I do not believe anybody could. While a few have punished themselves sufficiently by losing money on taking contracts a large number seem still to continue in the business.

I saw a reference a short time ago to the importance of a man being protected against himself. I think there is a good field among the hot water boiler people for some enthusiast to do a great mission work in this direction, that could be classed as a blessing pure and simple.

AMALGAMATION.

The question of amalgamation of the two associations of Master Steam Fitters and Master Plumbers, which has been discussed pro and con, and of which President Hudson spoke very decisively in his report last year, has been decided, for the present at least. You will remember the report of the committee appointed last year to consider this question by our president, which was as follows:

"We, the committee appointed to consider the question of amalgamation of the Master Steam and Hot Water Fitters with the National Plumbers' Association, respectfully report as follows:

We would recommend that the executive committees of the two associations confer together in regard to matters affecting the two associations, and that the two associations be governed by the combined action of this joint committee, the same as each association would be by their own executive committee, but we do not recommend the amalgamation of the two associations any further than this, as the two trades are so distinct and separate that the steam contractors would have very little interest in the reports on sanitary questions, and the plumbers would have very little interest in the reports on heating and ventilation, so that instead of being a benefit it would be a detriment to both associations to have a closer connection than above stated.

We recommend that a committee of three be appointed to wait upon our National Plumbers' Association next week and report to them our action upon this matter, and that said committee report to the incoming executive committee the action taken by the National Master Plumbers' Association."

This committee was duly appointed as per the above, consisting of Edward Grassler, Robert Sproul, and D. M. Quay.

We were not further apprised in this connection until the latter part of February, 1894, when we received the following letter from D. G. Finnerty, President National Master Plumbers' Association:

"BOSTON, FEBRUARY 24, 1894.

GEORGE H. REYNOLDS, *Secretary*,
Master Steam and Hot Water Fitters' Association,
New York City.

Dear Sir:—I am instructed by the executive committee of the National Association of Master Plumbers, which convened in this city on the 13th inst., to inform you, and through you your association, that the committee does not deem it advisable at the present time to appoint a joint committee between the Master Steam and Hot Water Fitters' Association and the National Association of Master Plumbers, as embodied in a paper presented to the National Association at its last convention by a committee from your association, consisting of Edward Grassler, Robert Sproul, and D. M. Quay.

I inclose you copy of our last convention proceedings. See paper above referred to on page 166.

Yours respectfully,

(Signed) DANIEL G. FINNERTY,
President."

The executive committee touch upon this in their report.

It is painful, indeed, to be called upon to announce to you so long a list of losses by death of valuable and worthy members in our organization since our last meeting. Herman A. Kroeschell, of Chicago; Hazen Mooers, of Milwaukee; I. Lincoln, Jr., of Chicago; George Strong, President of the Joliet Local; and William Costello, of South Boston, Mass.

In conclusion, in grateful appreciation of the support of our President and Executive Committee, and of many faithful and energetic members in the work for you, I wish to express my most earnest thanks, and to add that the future success and dignity of your commercial affairs depends largely upon lines mapped out at this meeting. I say this, believing that no convention you have yet held can be classed with it in importance. Recognizing how easy and natural it is to err causes me to look upon the results of your present gathering with much concern. In proportion as you study and prepare in the interest of the whole will you best serve yourselves individually. No single person's interest to the detriment of the mass of you should receive one moment's consideration. This last remark particularly includes your present secretary.

Hoping that the best possible action in your behalf will prevail, I again thank you, one and all.

The next report to be read was that of the treasurer, E. D. Smith of New York, a summary of which is given below.

REPORT OF E. D. SMITH, TREASURER.

SUMMARY OF RECEIPTS.

Balance reported on hand June 1, 1893	$1,245 46	
F. W. Lamb, balance of petty cash account, etc.	6 29	
Back dues	397 50	
Admission fees	50 00	
Sale of water cooler	7 25	
Receipts from 1893 Souvenir	1,610 00	
Master Steam Fitter for steno, bill paid	125 87	
Interest account	45 28	
		$3,487 65
Locals.		
Buffalo	$ 170 00	
Chicago	1,460 00	
Joliet	60 00	
Massachusetts	1,065 00	
New York	1,751 25	
Isolated members	485 00	
St. Louis	90 00	
Rhode Island	105 00	
Milwaukee	170 00	
		$5,356 25
Total Receipts		$8,843 90

DISBURSEMENTS.

Bill of Steno, at Boston, etc.	$ 125 87	
Expenses of Chicago Convention, etc.	152 25	
Moving expenses from Chicago	137 15	
Rent of office, etc.	490 37	
Stationery, printing, etc.	231 56	
Expenses on Souvenir	1,304 67	
Expense on standard flanges	94 68	
Traveling expenses of Secretary	186 00	
Miscellaneous expenses, including P. O. stamps, etc.	303 81	
Salary George H. Reynolds, Sec'y	4,400 00	
E. C. Jones, clerk	1,200 00	
		$8,626 36
Balance on hand to new year		$217 54

After some discussion the report of the executive committee was read by J. F. Wells.

REPORT OF EXECUTIVE COMMITTEE.

The reports of our president and secretary having covered all congratulatory features leave us no duties to perform in that direction any further than to say; we welcome and are indeed glad to meet you, and we are with you, of you, and for you.

The chief work at this convention is to endeavor to anticipate what the conditions before us are likely to be, and to plan wisely enough to meet them in the most substantial and far reaching manner, remembering always that we are ever nearest success when we are adhering to the lines of consistency and justice.

This sentiment should be carried particularly into our local relations with each other, as well as our national. New lines, new men, new ideas, and developments of every description are constantly being introduced. Those who are attempting to do their business to-day, locally or nationally, upon the conditions that existed two, five, or ten years ago, will learn later to their sorrow that they have not fully kept abreast of the unceasing march of progress they are ever forced to come in contact with.

While it might have been comparatively safe ten years ago to presume upon a continuance of given patronage, it will not do to build upon any such expectations to-day, when younger men are inheriting seats at the commanding desk, bringing to it new conditions, new associates, and new friends made in other channels and at other clubs. No single firm can stand now and successfully say, "We are the people." Where it was once mostly multiplication and addition it is now nearly all division and subtraction. We must not forget that the school-house of the present is preparing well equipped contract seekers more rapidly and in greater numbers than in the past. Added to this, they have the advantage, through the numerous trade schools in different sections, of becoming practical and trained experts in a time brief compared to the old methods of developing men. Hence the necessity of those in the business now following lines that are least likely to leave their profits with those for whom the work is done. There is nothing rational in conducting our business at cost prices this year with a view to advertising, trusting that by such means we shall insure an increase of patronage later on to which we may add fair profits.

Our president has said all that is necessary with reference to the standardization of flanges, and, in fact, has covered a great many other points, and thus saved the committee some trouble, and we hope his remarks relative to the importance of this association will receive the consideration due them. We admonish you all not to wait for the absence of this organization to be convinced of its value and worth.

On account of the total disregard of the resolution passed last year requesting supply men not to sell to the consumer at all, we recommend that it be rescinded, and that in its stead we return to our national consumers' discount sheet, which we believe it will now be safe to do provided our experience in the past is properly considered in the manipulation of it in the future.

Our secretary is justified in claiming that the supply men will sell to the consumer, and that members of this association will not take the necessary stand to prevent them from doing it. This in our opinion leaves us but one course to pursue, and that, as said before, is to return to the discount sheet. Although this has been practically obsolete so far as the past year is concerned, the present conditions remind us that the four former years of its operation had become so fixed in the minds of the sellers of goods that it has received in a measure the same consideration it did during its life. This encourages us in the belief that the sheet did meet largely the approval and support of the sellers of goods, attributable in a great measure to the fact that fair men in trade are inclined to adhere to prices that insure a consistent profit, which a discount sheet such as we had aids in accomplishing.

It is evident that not only the supply men but our own members have conducted their business the past year in a large measure upon the same lines they did while our discount sheet was in practice, and we, the committee, make our report from this standpoint, recognizing that on account of the way all concerned have completely ignored the action taken at our last convention, whereby the consumer was to get his goods entirely through our people, there is nothing left for us to do but to ignore it also. With this in view, we have to add that the insignificant number of complaints lodged at headquarters during our term as executive committee is remarkable for one of two things—either members have neglected to perform their duty in advising of abuses, or else our association is of many times more value than a few seem willing to acknowledge. Surely, if the supply men have treated the trade fairly, even in a small degree, it is due to the respect they have for this, our national organization. If they have not done so, and they have not been called to task for their digressions, it has been the fault of members of the association in not submitting grievances to this committee.

It may be due to ourselves to call to your minds the circular issued relative to this question, dated September 1, 1893, showing that the committee discharged its duty so far as it could, for certainly we were powerless to undo an important measure of this character enacted at the last national convention. A copy of this circular may be found (if any choose to read it) on page 97 of our official scrapbook.

A committee should be very carefully and judiciously chosen to adjust this question, which is undoubtedly the most important that can be looked after at this meeting.

In connection with the Osborne suits, as mentioned by the secretary, we have to report that but

one prosecution has been undertaken this year, and that against a member of the executive committee. We wish to call to your attention that this feature again emphasizes the importance of our association.

While we believe there is no validity in the patents held by the Osborne Engineering Co., there is no question but Mr. Curran would have in this instance, if defending his case single handed, for prudence sake and as a matter of least cost to himself, considered and accepted some proposition of settlement rather than to have plunged into the uncertain expenses of litigation It is well to remember that while there have been a number of instances of prosecution by this company, they are insignificant in comparison with the multiplicity of cases that would have been brought in the event of there having been no association and no arrangement for a combined defense.

In answering the questions many times asked in regard to the value of our organization, and what it has accomplished, it is to be regretted that the sum total of what the association has prevented in the way of disaster coming upon our trade cannot be pointed out, and it becomes doubly lamentable when we remember that it is a condition none realize or appreciate, even in a fractional part.

In regard to the matter of publishing a souvenir the present year, as already stated in the secretary's report, the committee felt that the circumstances did not justify their incurring the necessary expense, but recognizing that issuing the Souvenir in December or January following the annual meeting has a tendency to revive interest in the association at a very essential season for a reminder of this nature, or some other, the committee concluded to keep this question open until the assembling of the convention.

Undoubtedly a committee should be appointed to discuss this feature, and for its benefit we suggest that the matter of applying for advertisements be left with the incoming executive committee, authorizing them in case they secure enough to pay for the expense to publish the proceedings in Souvenir form, according them the privilege of omitting publication in the event of failure.

It is perhaps due you that we refer to our lack of membership in cities with less than 75,000 inhabitants. There is no doubt but the firm stand taken by steam fitters in our large cities reflects a benefit to the lesser ones referred to, and there is no question either but that the disorganized condition in the smaller cities reflects detrimentally to the larger ones. It is certain that if steam fitters in these cities would take steps to benefit themselves through organization, and become members of the National, Association the result universally would be of great benefit.

The query arises, why do they decline to do this? We have a few men in cities of less than 50,000 inhabitants who have benefitted themselves wonderfully, and they are a substantial aid to our organization. If there could be a general, spontaneous uprising of such a character in all these cities, the good returns would be beyond any man's power to foretell. They can have a membership with us at the rate of $10 per year, and the amount it would cost them to maintain their local would be merely nominal. Can it be possible they think it is profitable to them to save these small amounts? Surely they could not prove that it is by those who have tried it in an earnest and substantial manner.

This has been a problem of much concern to every former executive committee, as well as the present one. There has been much thought and work devoted to inducing such parties to join with us and thus rectify many irrational things that exist among us. It has been impossible thus far to move them, and it is beyond our power at the present time to point out a remedy, but we do hope that at this convention some one will be able to make suggestions which will prove profitable in this direction, or else, as our president suggests, we should look after our own affairs and cease further urging in this direction. The national association up to date has been almost wholly supported by the larger cities, and possibly we shall be forced in the future to rely entirely upon these sections for maintenance without endeavoring to do any particular good outside their limits, for surely it is discouraging to be forever pleading in vain.

Relative to the house-heating boiler question, as slightly touched upon by the secretary in his report, we think this feature should be again gone over at this meeting. Possibly some one may have a recommendation to make. We suggest that a committee be appointed to consider the matter. Some of the boiler men who have had a wide experience in installing work claim to have abandoned that practice. We suppose it is fair to assume that others will, through the same experience, later on do likewise, but we must admit that it is slightly aggravating to have to wait for these people to gather in this very costly knowledge.

It would not be so provoking if the losses and injury all fell upon themselves, but that is not the case. It reflects on all of us, and their patrons as well. It forces us in many instances if we take contracts to leave our profits with our customers, while on the other hand, we are injured by the imperfect work put in from time to time after it is learned that the contracts have been taken at figures that are sure to cause a loss of money; for surely, when they do that, they are by necessity forced to furnish as little as possible and put that little in in as cheap a manner as they can conceive of and have the whole pass inspection and get their pay. This injures steam and water heating the country over, for the reason that it causes many to hesitate about using either in small plants.

We hope some one has come to this meeting prepared to treat upon this subject with thoughts and words that will promise relief, which the boiler manufacturers in general stand in need of equally with our members.

The executive committee during the past year has not deemed it expedient to have the secretary make many trips, owing to lack of funds and to the universal depression existing throughout the country, as it seemed hardly advisable to spend any money that was not absolutely necessary in the committee's opinion to preserve the interests of the organization.

On his trip west there is no question but considerable good was accomplished in Cincinnati and St. Louis, and we hope some good in Cleveland. We expect to hear further from these cities at this meeting.

Referring to the letters read by the secretary from the states of Kansas and Michigan, we recommend the appointment of a large committee, covering as much territory as possible, to consider these communications relative to our scale of dues and to submit to this convention the advisability of a reduction to cover cases of this character.

This committee should be very carefully selected with a view to obtaining the best recommendations possible, and even then much caution should be exercised in accepting or rejecting what they might recommend, as this is a very important subject.

For the benefit of such committee we would ask their attention to letters on this subject which have already been read by the secretary, as there are important points therein which need to be carefully thought out.

Whatever action is taken at this convention will be from the standpoint of experience, and should have the hearty and unflinching support of every member of the association, recognizing that at future annual meetings it may be improved upon if results indicate that it can be. There should be a distinct absence of criticism by members, not forgetting that a man who can anticipate and prophesy correctly at this advanced age is one to be regarded as almost a wonder. Hence the importance of sufficient indulgence for errors that are certain to overtake us individually and collectively, each member agreeing within himself to keep quiet about such as are beyond the reach of the committee, with an earnest resolve to better them at the next convention.

The committee chosen at the last annual meeting in Chicago to make overtures to the National Master Plumbers' Association the following week at their convention in Milwaukee, relative to the executive committees of the two organizations acting in conjunction with each other, to take the place of the amalgamation project, seems to have met with but slight recognition, as per the letter read by our secretary from President Finnerty of that association. We see no occasion for further action on our part in this matter.

The irrational features of amalgamation of our association with any other was so clearly pointed out in ex-President Hudson's address last year as to cause all agitation in this direction to cease.

The inexorable messenger of death has again entered our ranks and we are sorrowfully called upon to note the following demises within the past year: Herman Kroeschell of Chicago, treasurer for the first three terms and a member of the preceding executive committee; Hazen Mooers, of Milwaukee; I. Lincoln, Jr., of Chicago; George Strong, of Joliet, and William Costello, of South Boston.

This committee has taken cognizance of these events upon its minutes, and will leave it with a committee to be appointed to appropriately express the appreciation of the association of these late members.

The president then announced the appointment of the following committees.

STANDARD FLANGES: E. P. Bates, A. C. Walworth, S. J. Geohegan. PERMANENT HEADQUARTERS: E. P. Bates, A. B. Franklin, Geo. A. Jackson. CONSTITUTION AND BY LAWS: A. B. Franklin, Wm. P. Thompson, E. P. Bates, John Davis, A. C. Walworth. APPEALS AND GRIEVANCES: C. H. Simmons, A. E. Kenrick, F. A. Williams, Geo. H. Morris. GOOD OF ORDER: Wm. P. Thompson, Jno. W. Danforth, Wm. E. Bartlett, J. F. Buerkel, A. B. Franklin, G. H. Hudson. CREDENTIAL COMMITTEE:—A. E. Kenrick, E. D. Smith, C. H. Simmons, Wm. P. Thompson. REINSTATEMENT OF DISCOUNT SHEET: James Curran, C. H. Simmons, John B. Hughes, A. C. Walworth, P. H. Kenricken, E. D. Smith, John Davis. HOUSE HEATING BOILER QUESTION: John W. Mills, H. J. Barron, Geo. H. Morris, John W. Danforth, Chas. B. Kruse. WAYS AND MEANS, (INCLUDING PUBLICATION OF SOUVENIR): Wm. P. Thompson, E. P. Bates, J. L. Wells, Geo. A. Suter, John B. Hughes, Jno. F. Buerkel, A. B. Franklin, W. K. Downey, John Danforth, C. H. Simmons, Alfred Gawthrop. GUARANTEEING TEMPERATURE: E. P. Bates, Jas. Curran, John Danforth, A. E. Kenrick, Geo. A. Suter, Fred. K. Van Court, S. J. Geohegan, W. K. Downey. RESOLUTIONS OF SYMPATHY, ETC: A. B. Franklin, John Whittet, Wm. S. Phillips.

After this announcement the convention adjourned until 10 A.M., June 20.

MORNING SESSION, JUNE 20.

The convention was called to order at 11.35 A. M., by the president who asked for the reports of committees. The committees on Standard Flanges, Permanent Headquarters, and Constitution and By-Laws failed to report. As bearing upon the subject of constitution and by-laws Mr. A. B. Franklin of Boston, chairman, read a report made by a committee selected by the Massachusetts Local, as to the value of the National Association and an alliance with the Master Plumbers, favoring an alliance between the two associations only in so far as to secure the adoption of some protective policy advantageous to both.

Mr. Kendricken of Boston then suggested that he clause in the National constitution compelling a steam fitter, in order to join a local, to be a member of the national body, be changed so as to make this unnecessary, letting the Locals decide who should or should not be members.

All the other committees failing to report the following resolution was read by J. W. Mills, and approved:

Whereas, We learn with pleasure that the annual convention of the National Association of Master Plumbers, now in session at Detroit, is a success both in attendance and enthusiasm, therefore be it *Resolved*, That we wire our congratulations and hope that both our associations will be successful in securing that protection which we both need to insure our success.

The following telegram was then sent to the National Association of Master Plumbers at Detroit:

We send congratulations on your successful meeting and hope each association will secure complete trade protection.

A communication from H. B. Brill, General Manager of the New York Trade Schools, inviting the members to inspect the Trade Schools, was read, thanks being extended for the invitation, which was ordered placed on file.

After deciding to give up the afternoon and evening of the third day, Jan. 21, to the entertainment provided by the manufacturers, and that the reports of committees should be the first business before the afternoon session, the convention adjourned until 1:30.

AFTERNOON SESSION, JUNE 20.

It was more than an hour after the time set for the opening of the afternoon session before the members were in their places and reports called for. Mr. Curran made a partial report on the reinstatement of discount sheet. As it was decided to consider this at a later time Mr. David M. Nesbit of London, Eng., read a paper on

ENGLISH PRACTICE IN HEATING AND VENTILATION.

MR. PRESIDENT AND GENTLEMEN:

It would be presumption on my part to address such a body of gentlemen as I see before me, on the subject of warming and ventilation, were I not to state at the outset, that I have come here from the old country to seek rather than give information on this subject.

I may say that, as a student of this profession, I have given much thought and attention to the subject and have followed your practice (American) very closely.

I have studied many American writers, among whom I may mention Baldwin, Billings, Briggs, Wolff, the very able Annual Reports of the Massachusetts Police by Rufus Wade, Esq., and the various journals published in your country.

I have been much interested in all I have read about your systems of warming and ventilation, and have thought how much you were ahead of us in this particular branch of science. Holding such opinions, I felt I could not do better than come and sojourn with you for a few days, and have ocular demonstration of some of your magnificent warming and ventilating plants.

I do not come before you with a paper full of new scientific ideas; I come before you as a student in search of truth,—one anxious to do the best work and get the best results, feeling that this great science, as undoubtedly it is, is one of evolution.

I am not anxious to make a great name for myself, nor am I anxious to amass a great fortune.

I feel I shall be amply repaid for my labor if by exertion and studious application on my part to the higher branches of this science I have been able to accentuate the cry for better warming and ventilation, thus benefiting humanity at large and improving the homes and workshops of the nation.

To make this paper interesting to you, I have thought of many subjects, but as I feel more of a student than a professor, I have come to the conclusion that a review or retrospect of the warming and ventilating profession in England as I have known it during the last 20 to 25 years would be the most interesting.

It is undoubtedly a blot on our English race, nay, civilization I might say, to have allowed this matter of warming and ventilation to be neglected for so many years, but I am glad to be able to tell you that with the close of the nineteenth century, better opinions prevail, and better warming and ventilation is much sought after.

The people themselves, the government, and their representatives, are now compelling employers and public bodies to see that their workshops, public buildings, schools, and other institutions are better warmed and ventilated than they used to be.

This is a sign of the times, but we have much to do before this humanizing effect becomes general, and, I am afraid that pecuniary interests, private enterprise, and trade nostrums militate much against its general adoption; but as surely as I am in New York to-day, compulsory powers will eventually come into force and sweep away those devices which are only a snare and a trap for the unwary.

In England, or properly speaking Great Britain, I might say we are passing through the "transition" state of warming and ventilation.

In the early part of my career it was considered quite good enough to run 2, 3 and 4 inch plain socket and spigot piping all round the rooms of our schools and other public buildings, with additional "box coils" for additional heat where required. These were used mainly in conjunction with low pressure hot water systems, and some of the best buildings built two or three decades ago, are heated in this manner, without (in many cases) a vestige of ventilation whatever.

To say the least, this system was not artistic, scientific, or very architectural, but it was the custom,—and the latter had to be maintained too often at the cost of injury to health.

The principles of ventilation in Great Britain were little understood, except to the few men whom I consider were the pioneers of the better systems of warming and ventilation.

To such men as the late Drs. Read, Percy and Carnelly, and engineers such as the late Chas. Hood and W. W. Phipson, we owe a debt of deep gratitude for maintaining a high standard in their designs and works which were entrusted to their care.

In some older works it was (and is now still, I regret to say) too often considered the right thing to insert one or two small Tobin tubes in a class room for 50 or 60 children, the result being that when ventilation was most needed these beautiful inlets—such as they were—were closed or stopped up to suit this or that faddist,

It is not an uncommon thing to note a Tobin tube 9 inches by 3 inches, considered quite the proper thing for a room of 8,000 to 10,000 cubic feet, such a room in our English schools accommodating 60 children.

Again, many architects and engineers considered it quite sufficient to have the inlets alone without any extraction whatever, and some going to the other extreme, they thinking it not necessary to have any inlets but plenty of outlets. These sentiments, I am glad to tell you, are falling rapidly into oblivion, and the better architects and engineers are readily falling into the idea of Shakespeare who made one of his characters say, "Where air comes in, air must go out," and when this is more appreciated we shall undoubtedly raise the standard of warming and ventilation in Great Britain.

Steam heating was little practised in England at the period I am now speaking of. At times one would see exhaust steam used for warming workshops and the like, but it was done in such a primitive fashion that it never made any headway. Hot air too had its day, several inventors, to my mind, having wasted much valuable time and money in bolstering up a rotten system. Some of the best scientists who have investigated this form of heating have signally pronounced against its continuance.

The only redeeming feature hot air heating has, to my mind, is its cheapness, but this is a small matter when it is borne in mind that we are imperiling perhaps thousands of lives by its adoption. It is dirty, dangerous to property, and the air given off is detrimental to health. The same remarks may be made about the high pressure hot water system, which was much used in England years ago. Both systems are falling into disuse and I hope to see the day when they will be practically discontinued.

Of course we have in England a Blackman-Smead system of hot air heating, and this to my mind ought to be classed among the systems that ought to be abolished. I need not dwell upon this, as you are fully alive to the Smead system in the United states.

I think the great revolution in warming and ventilating in the old country took its era about 10 years ago, and since then many good men have joined hands in promoting its birth, so to speak. I think that the radiator known in England as the "Leeds" radiator, but better known in your country as the Bundy, is largely responsible for the evolution of warming and ventilating that I am now speaking of. It was Mr. Lewis Leeds, I believe, who introduced the radiator into England, and who executed works on his own account for some time, but was not over successful, for what reason I cannot say; but after his departure from England the late Mr. Phipson took up this radiator and used it both for steam and hot water, with much success.

I think much of the credit is due to the late Mr. Phipson for the way in which he helped to inaugurate and develop a better system of warming and ventilation in my country.

About the time of the introduction of the Bundy radiator I became associated with Mr. Ashwell of Leicester, and since that date we have made it our duty not only to develop our business but to improve each succeeding contract that was placed in our hands.

We have had no stereotyped lines to work on beyond the primary principles of warming and ventilation. Each job has been considered and designed according to its own special requirements, and we have not attempted either to lay down a law that such and such goods as we make ourselves shall be used. We have aimed at having the best articles within our reach, whether of our own make or not, and this I believe has materially contributed to our success in the warming and ventilating business.

The first step in our early days (10 years ago) it was considered sufficient to give 500 cubic feet of air per child per hour, in our board schools, this being done by automatic ventilation.

In the early works coils of gilled pipes or gilled elements covered with cases were fixed in recesses under windows, to which air was admitted (see Drawing No. 19); the coils being worked with steam or hot water as best suited the case. In the second step we got to coils of gilled pipes with air gratings at the back, so as to diffuse the air over a large surface. This we found very efficient and much cheaper and less dirty, as the casings to coils were found to be receptacles for all kinds of filth and rubbish. In the third step we got to the "plenum" system, which to my mind is superior to all others when properly applied.

The extraction for these systems was invariably an aspirating shaft through which a cast-iron flue would pass taking the products of combustion from the boiler, thus helping to rarefy the vitiated air and causing extraction. In summer time we would use a "pilot stove" for warming the smoke pipe for the same purpose. I may here say that we proved beyond doubt that a combined system for warming and ventilation was not only permissible but absolutely requisite, and that we were on the eve of something better still.

Having thus traced you very briefly, a retrospect, so to speak, of warming and ventilation in England, I think it would be interesting to you to say a few words as regards the heating goods my firm makes, and then pass on to a description of a few of the installations my firm has executed.

The demand for the better work and the continued increase of our business as warming and ventilating engineers soon proved to us that a simpler kind of radiator as far as construction was concerned was much needed for our work, and after experimenting with many different makes of radiators, all of which in our opinion had some defect or other, the "Solar" radiator, as shown on drawing No. 21, was designed and patented. This radiator has proved very efficient, and it is so very simple in construction that the fitter can in a few moments, as it were, shorten or lengthen it on the job itself if needed. The joints are all tooled, and the loops are put together at each joint with an asbestos ring. The bolts for fastening purposes are not in the steam or water spaces, therefore no leakage occurs. The same radiator will do equally well for steam or hot water.

The form of joint with the diaphragm where the bolt passes through is the subject of the patent, and it will be readily seen that the diaphragm makes a continuous division the whole length of the radiator.

The necessity then arose for a ventilating radiator, which has developed itself as shown on drawing No. 21. English makers had not really grasped the idea of making what we considered a radiator with good sized air passages. Many ventilating radiators were made and advertised as such, but they were in name more than in reality a ventilating radiator. The jointing arrangement is similar in all respects to the non-ventilating (Solar).

Both these radiators look neat in design and very practical when fixed. This radiator is made so that it can be used for steam as well as hot water.

INDIRECT LOOP.

When we found the "plenum" system taking such a hold with us, we had at once to set our brains to work and devise an indirect loop for that style of heating, and this is shown on drawing No. 22, with our patent battery arrangement. This works equally well with low pressure hot water and for high or low pressure steam. Each loop is 4 feet high and is 8 inches from back to front, works at 6 inches centers and contains 9 square feet of heating surface.

We have some batteries of this surface at work 9 loops deep from front to back which equals 81 square feet of heating surface, and worked on the single pipe system 1¼ inches in diameter. These work well and give excellent results.

I would like to say a few words with regard to our patent battery chamber arrangement as indicated on diagram No. 22. In the first school that was executed on the plenum system (Melbourne Road, Leicester the ducts were 8 feet 6 inches high in the clear, with the heating surface overhead in batteries as shown, but this system proved so very expensive from a builder's point of view that the hint was given that if the plenum system was to be further introduced the ducts would have to be reduced in size so as to reduce the builder's work.

This set us thinking again, and we ultimately devised the patent battery and chamber as you see on diagram No. 22. This arrangement gives a clear headway of 6 feet to 6 feet 6 inches in height, we insisting on the latter dimension wherever practicable, but sometimes this dimension gets considerably lessened when we have committees and architects to deal with who rather prefer to compromise efficiency than cost.

This battery has proved very efficient in every respect. You will notice that the air passed along the ducts can be sent in warmed, cold, or mixed, as required, and we are now devising a plan wherewith we shut off any particular room entirely, if desired. Each room can be worked by itself, no matter how many there may be connected to the battery.

In England we prefer to give the regulation of the air into the hands of the caretaker, or janitor, as you call him. By doing so the manipulation of the incoming air is removed from the teachers, who must complain to the head teacher if the class room is too warm or too cold. We find this is by far the best plan, so that the regulation of heat is all controlled from below, and when once the shutters are set the caretaker can only reduce the temperature, the volume of air passing into the school being constant.

I think I have said sufficient about radiators for warming only, and radiators for ventilation and indirect heating surface. I may say a few words on boilers.

In steam work I have generally used Lancashire, Cornish, or vertical boilers of the ordinary heavy English make,—the lighter boilers such as you use not finding much favor with the English people up to the present. As to boilers for hot water purposes, I have invariably used the plain saddle, terminal end saddle, and Cornish Trentham boilers, all set in brickwork. These to my mind are by far the most economical.

We have tried the automatic damper to some of our boilers and have been fairly successful, but this too, in my mind, requires further development.

As to pipes, etc., you will, no doubt, think it strange when I tell you that we still use cast iron flanged pipes and fittings for steam work, for all sizes over 2 inches internal diameter. This is largely due to the English manufacturers of wrought tubes, they not laying themselves out for making the larger sizes of wrought iron tubes.

We have used steam engines, gas engines, and electric motors for driving the fans, but I prefer the latter method where it can be adopted, as it is less noisy and requires so little attention. We have used the Blackman fan, as a rule, but in some cases we have found this fan very noisy when driven at a high speed. We have, however, some very good installations working with the Blackman fan.

Having thus sketched a rough outline on heating arrangements, it will, I think, not be out of place to give you a few typical installations which my firm have executed. The Municipal Buildings, Sunderland, is a low pressure steam job "gravity return" with ventilating radiators set in the window backs.

The boilers is what is termed 18 nominal horse-power, and the whole system works with 1 pound pressure on the gauge. The extraction is quite automatic, the clock tower being sufficient to create the necessary power. This is a two pipe system, all the return pipes being carried down below the water line. This job has been in work some six years, and it has proved one of the best installations my firm has executed.

Board schools, Newark-on-Trent, is a low pressure hot water system on the "circuit pipe" plan. A 4 inch plain pipe is swung round the buildings, as shown, with the ventilating radiators connected to them. Although this plan has been much criticised, I must say that to my mind it has proved one of the best installations of its kind.

Drawing No. 19 indicates the principle of bringing in the fresh air, the extraction of the vitiated air all being taken down to a main duct which communicates with an aspirating shaft 60 feet high. So well does this system work that it would be impossible for a stranger to tell off-hand which end of the apparatus is the flow and which is the return.

Nottingham Boro Asylum is what I term our typical job, and the one that has given, I might say, universal satisfaction. It is our first plenum installation in England, and it is looked upon as the model asylum in our country, both as regards the building and its warming and ventilating apparatus. (See drawing No. 1.)

The architect, for this asylum, George T. Hine, Esq., of London, ever to the front for all the latest improvements, consulted Mr. Ashwell about the warming and ventilation of this institution; and after careful consideration Mr. Hine decided to recommend the plenum system to his committee, which they adopted, and the installation has outborne the most sanguine expectations of it.

As you are aware, there is hardly a more difficult building to treat properly than a lunatic asylum, as so many points have to be carefully watched.

It was considered that 750 cubic feet of air per patient per hour would be sufficient; but owing to the largeness of the ducts, and the fans and engines having sufficient margin of power, we are able to send in to the various rooms an average of about 1,250 cubic feet of air per patient per hour.

In winter, when it is necessary to warm the air, this is done by steam coils placed in various points in the air trunks which are capable of being regulated to a nicety, so that any part of the building can be heated or ventilated independently of the other, and the dormitories independently of the day rooms; this latter is done by means of shutters in the sectional trunks.

Dr. Powell, the medical superintendent of the asylum, stated in his annual report to the committee that:

"So efficiently has the heating been done that a temperature of 60 degrees has been easily maintained throughout the wards, without the aid of any fires, and this when the thermometer outside registered 10 degrees of frost. The dormitories and single rooms are just as easily warmed at night.

"Those who are intimately acquainted with the working of an asylum will readily imagine the immense comfort of being able to do without fires in the wards. There is no crowding around the fire places, and no quarrelling for the best seats, but the patients sit scattered about at the windows and at tables, just as in summer. It was expected that there would be some grumbling at first at the absence of fires, but, strange to say, I don't think I heard a single complaint. Another great advantage this system of heating has over most others is, the entire absence from the rooms of all pipes and other heating surface.

"The ventilation is also equally successful. It is very observable in the dormitories and single rooms; the air in these appears to be almost as pure in the morning when the patients get up as in the evening when they go to bed."

Claybury asylum, which holds 2,000 patients and 500 attendants, came to be treated next, the architect being Mr. Hine, as before.

It was considered by the committee inadvisable to adopt the plenum system on such a large scale, so it was decided to treat the asylum more on an automatic principle,—the chapel, recreation hall, and workshops on the plenum system only. The whole of the warming is done by steam at 40 pounds pressure.

The boiler-house contains ten steam boilers in all, but three of these are exclusively for electric light purposes. The remaining seven boilers are for supplying steam to warming and ventilating apparatus, heating hot water for bathing and other domestic purposes, driving laundry engine, and supplying steam for the laundry horses (of which there are ninety-five), cooking apparatus, kitchen, etc.

It was calculated that, when the full work would be on the apparatus in winter time, six out of the seven boilers would be required to do the work, the spare boiler acting as a stand-by in case of break-down. The boilers are of Galloway's make, and are 28 feet by 7 feet diameter, and are capable of evaporating 6,000 pounds of water per hour each. From the boilers we commence with the main steam-piping, which at the starting point is 10 inches in diameter, this splitting into two pipes, one 7 inches and the other 5 inches diameter.

The arrangement of this piping (this must necessarily be the case with such a complex installation as an asylum) is very intricate, but one of the most important features in this work is that the steam-pressure is not reduced at the further ends of the mains more than 1 pound pressure from the initial pressure of 40 pounds at the boilers.

The mains are all drained at intervals of 100 feet lineal, so that the steam is kept perfectly dry while it is making the circuit of the main piping. In this job alone there are approximately 22 miles of piping.

The corridors and part of the administrative offices are warmed by means of direct radiators, covered with neat cases of perforated wrought iron. All vertical steam-pipes in the wards, etc., are covered in a like manner, to prevent the patients from hurting themselves. There is 60,000 square feet of heating surface in these buildings.

From the heating chambers, flues in brickwork or rectangular pipes (these being of various dimensions according to the various requirements) are taken up the inside walls to the various rooms, and discharge into the rooms through a cast-iron grating, about seven or eight feet above floor-level.

The ventilation is done on similar lines to the warming, corresponding flues going up from the several rooms and discharging into horizontal trunks in the roof spaces, and these are connected with the turrets which are fixed for the discharge of the vitiated air. Under each turret a coil is fixed, and supplied with steam from below, but this is intended for summer more than winter ventilation. It is considered that in winter time the ventilation will be all that is desired without the steam coils going in the roof. This of course has to be tried yet, and we must wait the result.

The warming of the water for bathing and other domestic work is no small matter, when it is borne in mind that there are 2 000 patients and five hundred attendants to be cared for. For the patients there are male and female bath-houses, the former having twenty-four baths, and the latter thirty-two. The asylum is built for 800 males and 1200 females.

The water is heated in two tanks overhead in each bath-house, which measure 12 by 4 feet, by 3 feet 3 inches high. In the tanks are placed copper coils through which steam is passed, thus heating about 950 gallons in a very short space of time.

For the more domestic work this had to be slightly different, the hot-water cylinders varying in size from 100 gallons to 150 gallons, these being fixed in the basement; they are also arranged with steam-coils made of copper for warming the water. From each of these cylinders the plumbers have laid the circulation pipes to serve the scullieries, slop sinks, lavatories, etc., with hot water.

This installation was designed and carried out by my firm in conjunction with Messrs. Korting Bros., of Hanover (Germany) and London.

Melbourne Board Schools, 1,600 scholars, was the next plenum installation of note. It is a low pressure gravity return steam apparatus, designed to give 1,000 cubic feet of air per scholar per hour, but thanks to the largeness of the flues and ducts, it is possible to get as much as 1,250 cubic feet of air per scholar per hour.

The clerk to the Leicester School Board says:—

"The building is of two stories, with an accommodation for 1,600 children. The system was adopted by the board after a careful consideration of all the best methods used throughout the kingdom, and the efficiency of the apparatus has more than fulfilled the expectations that were formed of it.

The board is of opinion that it will prove to be the system of the future for heating and ventilating large buildings. The leading features of the system are as follows:—(1) simplicity of working; (2) economy of fuel, the cost being no more than other large schools where the system is not adopted, and the gas for the engine only costs about four shillings and sixpence per week; (3) rapidity with which the temperature of any given room can be raised or lowered, 60 degrees being in the coldest weather easily attainable at the opening of a school by commencing firing at 6:30 to 7 A. M.; (4) the regulation of temperature of each room is completely under control, independently of any other, but the amount of fresh air cannot be diminished; (5) the air of each room is changed from five to six times per hour, and is always fresh and wholesome; (6) the air being drawn from one central point and filtered, the school is thereby kept clean and free from dust; (7) the apparatus does the work of disinfecting when necessary, very speedily and thoroughly.

The health of the teachers and scholars in the school has compared most favorably with other schools, and the board is in every way satisfied with the system of heating and ventilation supplied by Messrs. Ashwell & Nesbit.

Mr. Locke, the head master, says: "For keeping the air pure and at a uniform temperature, the plenum system of warming and ventilation is most effective. During the past fifteen months—the period the school has been open—the absence of teachers from illness have been reduced by one-half. All the teachers testify to the absence of headaches, which they formerly felt under the old conditions. I may add further that the whole school may be fumigated by this system in the short space of three minutes."

The conclusion I have come to in my own mind is, keep the air passage large, boilers, pipes, and heating surfaces ample, as it is easy to reduce the temperature or diminish the amount of air flowing into the buildings, but most difficult to increase these matters if they are designed too small.

Another installation of ours, which is on the vacuum system, works exceeding well, and is given on drawings Nos. 14, 14A. It is an exhaust steam job. Turbine engines are used for developing the power required for the electric lighting, and the exhaust steam, after passing the engine, with a back pressure of 5 pounds, is passed into the header, as shown, and from thence to the different sections in this huge pile of buildings. It was working all last winter, and has given general satisfaction. This is our very best job on exhaust steam heating, and we might add that we are very proud of it.

I might keep on adding various installations that my firm have erected, but I think this would be wasting your time. I give a schedule showing some data employed in a few installations erected, and I shall be pleased to give any members of your association a few more particulars of any particular work, should they prove interesting to them. I have also brought with me for your inspection some plans of the works we have executed, and I shall have much pleasure in explaining them to any member feeling interested.

Now, Mr. President and Gentlemen, I may say in conclusion, that I fear I have not told you much that is new, but if I have interested you in the least with these few remarks with what we are doing on the other side of the Atlantic, I shall feel amply repaid for the little trouble I have been at in preparing this address.

It is indeed very kind of your association to extend to me, a perfect stranger to these shores, an invitation to address you, and to have given me such a kind reception and hearing.

I look upon this day as a red letter day in my career as a warming and ventilating engineer, and I only regret that we have not such an institution to boast of in the old country, but, gentlemen, I shall be pleased if any of your members should visit the old country, to reciprocate the kind favors you have shown me during my visit, and if I am not able to give you an invitation to our society, which unhappily is not yet born, I would endeavor to show such member or members, plants which I think might be interesting to them.

I thank you, gentlemen, one and all, most heartily for the kind way in which you have received my few remarks.

A resolution thanking Mr. Nesbit for his able paper was adopted by the convention, Mr. Nesbit expressing his appreciation of the honor thus conferred upon him by a few well chosen remarks and with a hearty invitation to those who might visit England to call upon him at his home.

Following the acknowledgment of Mr. Nesbit, Mr. E. P. Bates of Syracuse read the following paper on

THE DIFFERENCE IN AMOUNT OF RADIATION REQUIRED IN BUILDINGS OF GOOD AND POOR CONSTRUCTION.

To illustrate the subject before us I will recite my experience in several buildings. In the fall of 1879 I placed a low pressure steam heating apparatus in a building designed for a home for old ladies. Many of the rooms were small, and in order to warm them without question a radiator was placed in each room Knowing that a high temperature would be agreeable the calculation was made that one foot of radiation would warm 40 cubic feet of air. This we considered very liberal when the fact that we used the Gold sheet iron radiator is taken into account. We were, however, doomed to a very serious disappointment, as the temperature in the rooms on the windward side of the house frequently fell to 50 degrees, and sometimes even below, during severe cold and windy weather. After reconsidering all the conditions we determined to add a large percentage of radiation, which was done, and the building has been thoroughly warm ever since. The amount of radiation added in many of the exposed rooms was from 50 to 100 per cent, over that originally supplied. To my mind the rooms in this building are very uncomfortable, for the excessive amount of radiation required to maintain the temperature produces a very disagreeable condition of affairs, together with the excessive loss of heat through the thin walls and many air leaks. It was soon found that although the ratio of radiation was very excessive under the existing conditions the condensation was very rapid, and more boiler power was required to maintain the steam pressure. Consequently an additional boiler was supplied, at the expense of the heating contractor, which gave plenty of generating power, but all this was accomplished at a heavy proportional loss to the contractor. To my mind as I review the entire matter I find that the original calculation for boiler and radiating surface were correct providing the building in question had been ordinarily well constructed. But from subsequent surveys I conclude that the architect and building contractor produced about as poor a specimen as it was possible to do and have it stand up as a public building. The result is that the amount of fuel needed to warm the building is enormous.

I have in mind another building which belongs to one of our popular colleges. This building was constructed in 1872. The location was on the brow of a high hill where the front was exposed to the force of the northwest winds. It was the intention of the heating contractor to make this building very warm, and all calculations were made with this object in view. After the apparatus was complete and the weather became cold it was found that many of the small rooms in the west front did not warm to the required temperature, and an investigation was made to determine the cause if possible. We referred to our calculations as to boiler, piping, radiating surface, etc., and found that the apparatus was constructed according to our calculations; nevertheless we were confronted with a number of cold rooms. We finally determined that the only way to satisfy ourselves was to live in the building and keep a record of the temperature, both in the rooms and outside. While this was in progress I visited the building one very windy day and in entering some of the west rooms I was surprised to find that the hall door would be pulled away from me and shut with a report like a gun. I supposed at first that the windows were open, but examination showed that they were closed as tight as possible considering their construction, but the air leakage was enormous; also that a large quantity of air was constantly driven through the brick walls of the building, in fact, the volume of air forced into the rooms was so great that the hall door was opened with difficulty. The radiators in these rooms were liberally increased and the warming of the building has been very satisfactory to its occupants. The heating contractor in this case did not meet with a decided loss, as a very liberal allowance for the exposure of the building had been made in the original calculations

Another rather striking case comes prominently before me. About eight years since I placed the heating in one of our State normal schools. The building was in a very exposed location and the radiating surfaces were very carefully apportioned in order to fully meet all conditions. One large class room, containing about 100,000 cubic feet, was provided with one square foot of radiation to 40 cubic feet of space. This was thought to be excessive at the time but we wished to do the work right the first time and not have any alterations or additions to follow the work, so the full amount of radiation was supplied. When the weather became severe this room was very cold and radiating surface was added at various times until the ratio was brought up to 1 to 18 and the desired temperature secured. The larger part of the radiation was direct, in fact, all radiation which was added was direct. I found that while standing in the room during a severe northwest wind, you could feel the wind on your face as it came through the wall of the building. In the illustrations cited the buildings were very carelessly constructed, the architects in charge giving very little attention to the minor details which have the most important bearing in the comfortable use of the building.

I will now call your attention to the reverse of the conditions named above. Last year I contracted to place a small hot water apparatus in an old residence which was being altered slightly and converted into a small apartment house. The building was not badly exposed, so the calculations were based on a moderate amount of radiating surface. The apparatus was complete in the fall and the tenants moved in. The fire had not been started but a few days when there was a general complaint of too much heat, especially in the bedrooms. I find that the latter contain about 1,500 cubic feet and a radiator of 32 square feet was used to supply the heat. Our advice was to shut the valve on the radiator and run the water at a lower temperature, and when very cold weather came they would be very happy with nicely warmed rooms. Our suggestions were partly followed, but the complaints of over heating were almost constant and after passing partly through the winter both owner and tenants demanded that all the radiators be removed from all the bedrooms at least. This was done and there remained in these rooms a riser of 1¼-pipe, which contains about four and a half square feet of radiation surface, in a room of 1,500 cubic feet, or a ratio of 1 to 333. The bedrooms being outside rooms, I have never had the opportunity to examine this house but there is no doubt as to its good construction. I might further say that I am advised that the temperature of the water is kept down to 140 to 160 degrees in the coldest weather.

A few years since I built a small stable. Its dimensions are 24 by 36 feet on the ground. The ground floor is used for a carriage room, horse stalls, harness room, etc. In practice the floor is commonly used as one room; above is a hay loft, with a room for the driver over the harness room. To my mind it is desirable to keep the stable moderately warm through the winter and to accomplish this with a moderate outlay in apparatus and fuel. Over the horse stalls is a ventilating pipe running through the roof. This pipe is 12 inches in diameter and is always open, summer and winter. Usually the air is going through it at a high velocity. There is no especial provision to bring air into the stable, but the doors and windows are ordinarily well fitted, and there are large leaks about the entrance to the carriage room which has a sliding door about 9 feet square and opens to the north. In using the stable no difficulty was found to warm it to 60 degrees in the most severe weather, and an ordinary globe stove was used with a grate 8 inches in diameter. The amount of fuel used per season is between three and four tons. The stove pipe passes through the driver's room and the heat given out by the pipe maintains a comfortable temperature in that room. I believe this stable is more comfortable in summer and winter than the average stable, although many of them may be much more expensive in construction. The stable is built of wood. The frame is balloon style, the upright studs are 2 by 4 inches, set about 16 inches between centers. On the outside of these studs I placed a course of rosin-sized building paper and one thickness of coved siding. In order to prevent the buckling of the paper at the laps, and to prevent a rapid change or circulation of air between the studs, I placed a 2 by 4 inch girth lengthwise (between the upright studs) on the sill; then, once in three feet, cut in a 2 by 4 inch as an additional girth. The paper being a yard wide abutted on this extra girth which held the edges tight and prevented the circulation of air from cellar to hay loft, and *vice versa*. On the inside of the carriage room, as well as other rooms on the ground floor, a course of building paper was used and ceiled over with ½-inch narrow Canada pine for a finish. Under the floor of the hay loft was laid a course of building paper also on the ceiling of carriage room before the ½-inch wood ceiling was laid. At the top of carriage room where the studs and joist join, I stopped off with boards to prevent the circulation of air. The idea of using the cross girths once in three feet and building paper on the inside of the walls was very amusing to the old carpenters employed on the work, but it is very satisfactory in a cold day and equally so in hot weather, the building being much more comfortable than many dwellings which are built at a much greater cost per cubic foot. It will be noticed that the stable here described is of very inexpensive construction and would be very cold in winter and hot in summer except for the succession of dead air spaces in the walls, cove siding being one of the poorest materials for keeping the wind from penetrating a building. Believing that I was correct in theory I determined to carry out my ideas more carefully in the construction of a house two years since. This house to which I will refer stands alone, fully exposed on all sides on high ground, in Syracuse, where the temperature frequently falls below zero, and occasionally 15 to 20 degrees below zero.

It is constructed of wood and is comparatively inexpensive. The frame is what is known as balloon with slight modifications. On the outside of the frame are placed hemlock boards planed on one side, and over the hemlock is placed a course of heavy building paper, care being taken to leave no bare places, or uncovered knot holes; also that the paper fitted properly around all corners, windows and door frames. A 2 by 4 was nailed to the sill to prevent the air from cellar going to the attic or *vice versa*. Once in three feet a cross girth 2 by 4 inches was cut in between the upright studs to make a dead air space in the walls. This was also done in the partitions. At the ceiling of each story, a board to fill the space between the joist was inserted; said board was covered with building paper. Over the partitions in the center of the house a stop off was inserted in a similar manner to prevent the air from passing from side to side of the house and cooling the ceilings of the various rooms. The roof boards were covered with paper before the shingles were laid. Every point was carefully looked after to prevent air leaks, the object being to get dead air spaces in all the walls as far as possible to do this. The next point was to install a good warming apparatus, and after having the old saw about shoemakers' wives and blacksmiths' horses handed to me several times, I determined to erect a heating apparatus which would surely warm the house every day. I therefore placed in the house a No. 6 Bate's self feeding boiler containing 103 square feet of fire surface. This boiler is brick set. Allow me to speak of a peculiarity of this boiler, quite different from many which are advertised. It does not save any coal. They will burn all you fire into them, but if the firing is done with any reason the boiler will give you an equivalent in heat for every pound of fuel it consumes. The house in question being three

stories it was decided to make a combination apparatus, i. e., hot water and steam, using hot water stacks for the five principal rooms, and steam radiators for bath, back hall and the small bedrooms. The hot water was circulated from the water line, the boiler being set in the usual way for carrying steam, with automatic water feeder, automatic draft door, etc. I placed in the house, which contains about 16,000 cubic feet of space, 457 square feet of radiation, equal to one square foot to 33 cubic feet of space to be warmed. Of the above, 350 square feet was in the indirect hot water stacks and 127 square feet distributed in seven small radiators. For ventilation I built one chimney stack which connects conveniently to most of the rooms. In this chimney stack I placed eight tile flues made of vitrified pipe without hubs and all eight inches in diameter except the flue for the fire place in dining room which is 10 inches in diameter. These flues are used as follows: one for steam boiler, one for laundry stove, one to ventilate laundry (being three in basement); one for fire place, one for range, and one for hood over range to take off heat and vapor from cooking (being three on ground floor). On the second floor there is one flue from the large bedroom at the base of which is set a Franklin stove, and the other and eighth flue in the back hall. The bathroom being several feet away from the chimney has a separate flue of tin and galvanized iron extending through the roof independently, with a globe ventilator on top. Every test made shows each flue carrying out a large amount of air, and those flues to which fires are connected are very satisfactory; in fact, they never fail to draw, and the course or velocity of the wind seems to make no difference, so it is evident that a rapid change of air is going on constantly.

As to results. When the thermometer registered 5 degrees below zero during the past winter we used one stack of pin radiators in the reception hall. Said stack contains eight sections. The register over the other stacks were kept closed, a radiator of 16 square feet in back hall of second floor was filled with steam, and a radiator of 18 feet on third floor was partly filled, equal to ten square feet, or in all 108 square feet in active operation in severe weather. There is no doubt that we receive some benefit from the stacks where the registers were closed as there is a small percentage of leakage through the registers, and some heat given off by the tin flues running to the upper rooms. If only 108 feet were used the ratio would be 1 to 135. After having several cold days and demonstrating the fact that the amount of radiation was greatly in excess of the amount which could possibly be used, radiators were removed from the house, to the amount of 86 feet of direct radiation and 60 feet of indirect, the latter being the stack placed to warm the drawing room and was not used, as the room was thoroughly warmed by the hall stack. It was found also that during the coldest days and evenings it was comfortable to sit in any part of the house, even the rooms where the registers were closed, also that the difference in temperature between the outside and partition walls was slight. One fact worth mentioning is that the bathroom was in constant use, and that it was designed to heat it by means of a brass coil nickel plated containing twenty feet of one inch pipe, but the valve was not opened during the winter, the room being comfortable at all times to take a bath. During this season it is my intention to extend the tin flues to three bedrooms from which the direct radiators have been removed, as the stacks are abundantly large to supply them with heat. I might say in explanation that I should not have carried heat enough to raise steam, but for the fact that one of the upper rooms was used for a sewing room and steam was required to reach that room. In my opinion I shall not need to carry the water above 180 degrees the coming winter to perfectly warm the entire house. Under the conditions here described the boiler ran with the minimum of care, the draft door remaining constantly closed days at a time, the grate was shaken once in twenty-four hours in the most severe weather, and only once in 72 hours in very mild weather. With a temperature of 32 degrees outside, water at a temperature of 110 degrees to 120 degrees at the boiler was sufficient.

The question may now be asked what has all this matter of construction to do with our craft? We do not build houses or other buildings; we must take them as we find them, good, bad, and indifferent, and place in them a heater that will fill our guarantee, be it more or less. This is a fact from one standpoint. There is, however, another view to take of the subject. Every trade is responsible for existing conditions to a certain extent, by agitating a subject we bring about reforms, and if fifteen to forty dollars judiciously expended in the construction of a small residence will save the full amount in the value of fuel in one or two seasons and add largely to the comfort of the occupants all the time, our efforts are well expended in diffusing the knowledge of the fact and intelligent inquiry will be well rewarded in its research. Further, we all make our great successes in well constructed buildings and our failures and sometimes losses in those of poor construction. With this in view I hold that it is largely to the interest of the steam fitter and heating engineer to promote in every way possible the desire which the owner and architect may have for a well constructed building. "Continual dropping wears the stone"

Mr. Bates received the thanks of the convention for his interesting paper, and was followed by Mr. A. C. Walworth of Boston who read the following paper on

TYPES OF HEATING BOILERS IN THE UNITED STATES.

It is not within the scope of a paper of this character and length to enter into history to any great extent, yet it will not be amiss to take a glance backward and notice the development and separation of the several types of heating boilers in use to-day.

In the first half of the century there were few boilers in use for heating purposes only. Most of the boilers used for power were of the long two-flue variety with occasionally a hog-nose, a marine or a locomotive boiler, and where steam was used for heating mills, etc., as it sometimes was through large cast-iron pipes, it was taken from such boilers. There were, however, a few Perkins coil boilers in use in dwelling houses, which had been introduced by Walworth & Nason between 1840 and 1850, some of which are still in use, and whose type is preserved in the Baker car heater; and there were also some English saddle-boilers used in greenhouses, connected to four-inch cast iron hot water pipes.

To an increasing demand for steam and water heating, the inventive American mind was quick to respond with improvements and extensions of these primitive appliances. The multitubular horizontal boiler displaced the old two-flue boiler, cast-iron was introduced as a material for low pressure boilers, the sectional principle was made prominent as an element of safety, and the thousand and one useful appliances and attachments were devised, so that the approved heating boiler of to-day is not only a thing of beauty but an admirable and ingenious piece of mechanism, adapted, so far as human ingenuity can devise, to the peculiar and exacting demands which are constantly made upon it by people who seem to ask nothing short of a thinking and a reasoning automaton.

The system of heating water in a coiled pipe, was an attractive one to inventors, and for the last forty years we find that pipes have been bent, coiled and stacked over, under, and around fire boxes in every conceivable manner. Box coils, trombones, spirals, gridirons, bird-cages and many other forms have been tried. Some have worked well and some ill, but those that survive are of the simpler type, the more complex ones having been cast aside both on account of the mechanical difficulties of their construction, and their obstruction to free circulation. For boilers where compression into smallest bulk is essential or very high pressures are required, this type stands at the head as represented to-day by the Roberts, Almy or Herreschoff boiler. For steam heating apparatus, such boilers are not so often required, but for hot water circulators they have a wide field of usefulness from the large amount of surface which can be compressed into the space assigned to a house heater.

At this point it should be stated that since any steam boiler can be used as a hot-water boiler, and any hot-water boiler may be made a steam boiler by adding a steam drum, I have not separated steam and hot-water boilers in the general classification, as that would be an artificial rather than a real distinction.

The use of coil boilers naturally lead to the invention of water tube boilers, which is simply a fire-tube boiler with its elements reversed.

Walworth & Nason were making such boilers before 1849 with tubes standing at an angle of about 20 degrees from the horizontal, whether of Mr. Nason's invention or adaption I do not know.

This type of boiler proved strong and economical although somewhat expensive, its leading representatives to-day being the Babcock & Wilcox, Root, etc. The several makes of water-tube boilers came to the front at the Philadelphia exposition of 1876, where careful tests were made of their evaporative capacity with very favorable results, and many of the best house-heating boilers to-day are built upon their lines.

Horizontal water tubes suggested vertical water tubes, and this type to-day is possibly the most popular for house heating boilers of which there are many exemplars, both with open-end tubes and drop-tubes, which will be considered later under their respective headings.

One of the most prolific parent types was the English saddle-boiler mentioned above. This was a welded wrought-iron boiler, shaped like an inverted ∩ or saddle with a grate under it. This boiler was often used in greenhouses, and was so wasteful of fuel that a brick or tile flue was usually carried the whole length of the house under the cutting bench to utilize the waste heat. Our American boiler men substituted cast-iron for wrought-iron, closed in the ends, put a fire door in the front, and we had an old-fashioned greenhouse boiler. This was still wasteful of fuel, owing to its small fire surface, and improvements were made by using extended surface, corrugations or ribs on the inside, and also by adding internal smoke-flues, down-drafts, and other devices until this type of boiler has been made most useful for hot water apparatus not under head. These boilers I have classified as fire-box tanks.

Another form of fire-box tank was evolved from the tea-kettle by raising the fire up into the center of the kettle. To these, again, internal surface was added for the sake of economy either by extended surface, as by Scollay, by internal water-boxes as by Weathered, or by a coil as by Mahony. This class of boiler is simple, cheap, and useful for small dwellings, greenhouses, baptistries, etc., and is often used in its simplest form of a ring of water around a fire-pot, making what is usually called a fire-box stove.

From the water-tube boiler was evolved in easy sequence the cast iron sectional safety boiler. In using a material like cast-iron for a boiler it was evident that for purposes of safety each boiler must be subdivided into a series of small units. Mr. George B. Brayton of Providence, R. I. (so he wrote to Mr. John H. Mills), made a cast iron sectional boiler, bolted together with faced joints, at Westerly, R. I., in 1849, but it was 1864 before the type was practically introduced, this boiler being apparently the pioneer of the numerous horizontal cast-iron boilers with vertical strata. In 1859 Mr. Gold patented a boiler of this kind, bound together with three string-bolts. A suit brought by H. B. Smith & Co., against J. A. Ingalls & Co. (now Ingalls & Kendricken) throws some light on the history of this kind of string-bolt boiler. The defendants were the successors of T. S. Clogston & Co., and were making the Clogston boiler, a cast-iron string bolter. They proved in court that Mr. Joseph Nason was making in 1855 a cast-iron boiler with short horizontal water tubes entering a vertical tube for each section, and the sections being united into a boiler by a string-bolt through a water ring at the ends of the vertical tubes. They also proved from the French patent records that one Quesiphore Pecquer patented in France a boiler of this type in 1825. As a result they gained their suit and the string-bolt sectional boiler was open to the world.

Some time before this the Exeter Machine Works had bought Brayton's patterns and patents, and were making the so-called "Exeter" boiler, which still maintains its high reputation in this group.

In 1870 Mr. E. C. Clay of Boston devised a cast-iron sectional boiler for dwelling and greenhouses, using instead of faced surfaces, two horizontal drums to which the sections were connected by lock nut nipples, and it was at this time also that Mr. Mills was developing his boiler at Walworth's foundry at Cambridgeport, Mass. He also adopted the locknut, screwed connection, after discarding the faced joint and the right-and left nipple, being the first, I think, to use it in this kind of boiler. It proved popular and was adopted by the Exeter people, J. A. Ingalls & Co. H. B. Smith & Co., and others for large boilers of this type.

Sectional boilers with vertical sections readily suggested vertical boilers with horizontal sections, originating the cheese-cake style of boiler, which has been made in such large numbers and seems to be the predominant type of small house boiler. In 1874 the Canadians were using a great deal of hot water apparatus and importing many English boilers, and this naturally caused them to invent and build boilers of their own, which proved better than the imported ones. About this time Rogers & King, of Montreal began to build the "Spence," a square layer boiler named after the foreman. Mr. Gurney of Toronto, a stove founder of business capacity and ability, was the first to improve and push these buckwheat cake heaters as a commercial enterprise, and by combining a good heater with judicious advertising, he has placed thousands of them throughout the United States. They seem to be an evolution of the square "Stafford" and "Spence" heaters above mentioned. These pancake boilers are, like their horizontal cousins, either string-bolted like the Gurney or nippled like the new Winchester and Hub and their name is legion.

Most makers of house boilers issue well gotten up circulars or pamphlets, describing their boilers in detail. These are sometimes elaborate and handsome books, with cuts of boilers both assembled and detached. If complete, they give tables of the data of the different sized boilers, such as number and size of tubes, outside dimensions of boiler, size of smoke-pipe, tapping of outlets, square feet of grate and amount of boiler surface, also the number of square feet of direct or indirect surface that the boiler is supposed to carry, that is, the rating of the boiler. In the competition of an open market this is inevitably high as the maker must rate his boiler, as his competitors do theirs, at what it can do and not at its duty under every day average and sometimes unfavorable conditions. The safest way for the heating engineer to determine the size he needs is to estimate the amount of water his apparatus will condense per hour, the only true gauge of its requirements, and allow one square foot of grate for every 60 pounds of water condensed per hour, which means a coal consumption of 6 to 8 pounds per hour. For good economy I claim that a boiler should have not less than 35 square feet of boiler surface for each foot of grate surface, and this surface should be real and not nominal. The above ratings will give from 170 to 200 square feet of direct surface per square foot of grate, but for boilers of larger size this will be of course a larger figure, but depending invariably on the evaporative power of the boiler. I find that hot-water boilers are more apt to be over-rated than steam, as there is no standard temperature for hot-water apparatus. I myself prefer a boiler that can carry the water to 212 degrees or higher, and this means very nearly a steam rating. In any case I do not think a hot-water boiler should be rated more than 25 or 30 per cent higher than the same size used for steam, yet 50 per cent is perhaps the more common practice.

I submit herewith a classification of the various boilers and types, general species, and sub-species from which, if it were worth while, a table of analysis could be made from the appended boiler lists, so that a person finding a boiler without a name could analyze it and bring it home to its maker in a few minutes. Of course, some boilers are hard to place as they are crosses between two species, like a mule, and my placing them in a certain category may be questioned, but I have arranged the boilers according to their salient points and submit my lists as the first *classification* ever made, so far as I am aware.

Taking the boilers in the order of the analysis, we have first the horizontal water-tube boilers. The high economy of these boilers arises from the large amount of surface that can be placed in a given space by using a square or rectangle instead of a circle, and the element of safety becomes more important as modern engineering demands higher and higher initial pressures. For steam heating this point is not essential, but this kind of boiler has been adopted by the New York Heating Co., for their central stations, where they supply heat for both heating and power. In all water-tube boilers the weight of water is small in proportion to the duty, and this is advantageous or the contrary according to conditions. The height required for setting these boilers, often forbids their use as heating boilers, where they must be placed in basements, and their surfaces are not so easily kept clean as those of the ordinary tubular boiler, as it is evident that the inside of a tube is more easily brushed or blown clean than the outside.

The vertical water-tube boilers have the same advantages as the horizontal with the additional one of not accumulating soot and ashes on their tubes by gravity. In order to be economical, however, some of these boilers, like the Firmenich, require a great height to obtain a proper length of tube. The drop-flue boilers seem to be best adapted of the vertical water-tubes for small heating apparatus, and in the last few years this style has been adopted by many makers, some of them changing from other forms. They permit the concentration of a large amount of surface directly over the fire, and the tubes may be termed self-cleaning, as an occasional brushing removes the few ashes that adhere to the vertical surface. The principle is an old one for steam boilers, and Mr. Nason made small house boilers on this plan before 1870. It has been claimed that drop-flues will not circulate freely, and will collect sediments, but practice shows that this objection is not valid. The Silsby Mfg. Co., who have made drop-flue steam boilers for many years, write to the Bolton Heating Co., that there is no trouble about rapid circulation, and that the tubes ought to last twenty years or more in a house boiler. As the circulation will take lead shot out of the bottom of the tube there is no

danger of sediment collecting, and the makers of the Bolton boiler tell me that they find the bottom of their loops actually polished on the inside by the rapid current. A disadvantage of these boilers is that they are not easily emptied of water, but this is an unfrequent demand, as heating boilers in summer should be filled to the safety valve rather than emptied.

Next in order come the cast-iron boilers. Cast-iron is not a material that commends itself to the mechanical engineer for boilers, since in them all strains are those of extension, which cast-iron is comparatively weak to resist. American ingenuity has evolved notwithstanding by the use of this material, a large class of boilers which have been especially successful for steam-heating purposes where higher pressures are not essential; while by subdividing spaces and using proper thickness of metal, they are made safe against explosion, and not especially liable to break down. The use of castings instead of sheet metal or tubes, enables the maker to depart from rectilinear forms and employ every combination of curves, arches, spheres, bends and corrugations, resulting in an almost infinite variety of detail, some good and some bad.

The horizontal boilers are the most popular for plants of 10 to 50 horse-power and the vertical or smaller ones of 1 to 15 horse-power. The horizontal may be subdivided into the screwed connections and packed connections either of which is good, if well made. These sectional boilers can be carried piece-meal into many places where a boiler in one piece could not be got; they also help out the heating engineer, when he is short of length but has plenty of width. Almost all these boilers are short of steam space and liable to lift water if forced beyond their fair rating, but for hot-water boilers they are especially useful, as their vertical circulation, aids the circulation of the apparatus, and their life is apparently longer than that of a wrought-iron hot water boiler.

All boilers of this class need especial care in cleaning; they are full of corners and pockets where soot and ashes collect, and are with difficulty swept clean either with a brush or a steam jet. It may be also added that a freeze is sure destruction to any cast-iron boiler.

Much of the above applies to the cheese-cake cast-iron boilers, with horizontal sections. These boilers are usually provided with cleaning doors for spaces between layers, which must be constantly used, as each layer is a flat shelf for dust to collect upon. Fortunately by using numerous layers these boilers obtain a large amount of bottom and vertical surface, and do not depend on this shelf surface which is apparently of little value, unless swept every day.

Also all these boilers would gain by using more sections, thus increasing the ratio of surface to grate but without increasing in proportion the cost of the boiler. Most of these boilers have water-fire boxes, which is an essential point for a house boiler, as when a fire is covered up for the night, and the drafts closed, it gives out little heat, except radially in a horizontal direction. In order not to dull the fire at the edges, they also have usually fire-brick linings or alternate fire-brick and iron. Some of these boilers are without outside jackets of non-conducting material and would be improved by such addition.

There are two conditions that lead an engineer to seek a coil boiler. One is where he needs a strong, light, small, and simple affair, and can use a circular or conical coil like a Baker heater, and the other is where he is assigned neither length, width, nor height and must pack many hundred feet of boiler surface in a few cubic feet; then he can use to advantage, as in some office building where basement space is worth $100 a square foot, a boiler like the Perkins or Almy. Of course, such boilers must have steam separating space, and enough of it, or they will lift water with great facility; neither can they be used except with pure or purified water, as a small amount of scale will destroy them. They are, however, economical of fuel and perfectly safe, being as stated before, adaptable to the highest pressures demanded in steam engineering. They should be run by an experienced fireman with his eye on the water-line, for the lower tubes once emptied they become red hot and bulge down into the fire-box in a very few minutes.

Next comes the old, reliable multi-tubular horizontal boiler, whose merits and weaknesses whatever they are, are known to every engineer, and for all-around heating plants it is to-day the most popular boiler made, and I think justly so. It is of strong form, low cost, easily cleaned, easily repaired by any boiler-maker, is loaded with no patent royalties, and when it blows up goes "all at once and no part first." I do not think, however, that there is a case on record where such a boiler, being used for heating purposes and the main supply valve kept open, has exploded. With a properly proportioned apparatus you will find it very difficult to get up over 15 pounds steam pressure on the gauge, while with 80,000 pounds tensile strength steel or a 48-inch boiler with ⅜-inch shell, figures 7,250 pounds per square inch, bursting pressure, or, using 5 for a factor of safety, 250 pounds, which would seem a safe margin beyond all per-adventure.

The regular vertical tubular boiler is not much used as a heating boiler, one great objection being that its vertical tubes are not easily brushed either from the fire-box or from the smoke-bonnet; nor are such boilers economical, owing to the short length of tube that is submerged, usually only ⅔ of the whole length. They also have a very hot smoke-bonnet when forced and have often set on fire the ceiling over them, where it has not been fire-proofed. This type has been modified, however, and the above objections being removed makes an excellent house boiler. Mr. LeBosquet obviated the latter objection, by adding a super-heating chamber over the tubes and under the bonnet, and J. K. Paul and others have added more surface by additional tubes with reversed draft, and by other devices, so that the boiler has been made as economical as others of its class and cost. A very simple and fairly good boiler with vertical tubes is made by a plain cylinder full of tubes set on end on a brick fire-box, and if brick setting is also used the outside skin of the boiler may be utilized for boiler surface. This boiler is hard to beat for low cost.

Locomotive boilers are not much used for steam-heating. They are rather too expensive for one thing. They are, however, a first-class boiler in a wood-burning region; perhaps the best adapted to burning wood of any of the types. The writer has also used them in large dwelling houses in Maine and New Hampshire, setting the whole boiler under the heating stack and utilizing the outside as heating surface, the same as the Gold boiler is often used.

The fire-box tank, that is, a fire-box in the inside of a water box is mostly used for greenhouse boilers where the head of water is only a few feet, as a cast-iron box is not a safe thing to put internal pressure on. It is safe to say, that these boilers are not economical unless additional heating surface is obtained by various devices, and the makers would seem to leave little to be added in that direction. So, too, many boilers have clinker doors just above the grate, which are very useful. The makers universally furnish a water-gauge, and two or three gauge cocks, and usually a gauge cock box or water column, a steam gauge and a diaphragm regulator for controlling the draft, usually arranged to open and close dampers, both at ash pit and chimney, or to open and check draft in the latter. For this top smoke connection I am inclined to think that a damper set by hand with a check draft operated by the automatic regulator the best combination. Hot-water boilers do not carry with them an automatic regulator, but there are a number of good devices to be found in the market if demanded. A hot-water boiler, however, is so different in its action from a steam boiler, that it can be satisfactorily regulated without an automatic attachment.

CLASSIFICATION OF TYPES OF BOILERS IN THE UNITED STATES.

THE ORIGINAL TEA KETTLE.

- WATER Subdivided.
  - Direct Passages.
    - Water Tubes.
      - Horizontal. — Ends of Tubes, Closed. [Nason.] / " " Open. [Root.]
      - Vertical. — Open Tubes. [Mouat.] / Drop " [Furman.]
    - Cast Iron Variform.
      - Horizontal. — Packed Joints. [Gold.] / Screwed " [Clogston.]
      - Vertical. — Packed " [Gurney.] / Screwed " [Hub.]
  - Serpentine Passages.
    - Bent Coils. [Baher Heater.]
    - Coils made with Fittings. [Garth.]
- SMOKE Subdivided.
  - Horizontal Tubular.
    - Tubes in one series. [Allen.]
    - " " several series. [Vogt.]
  - Vertical Tubular.
    - Tubes in one series. [Regular.]
    - " " several series. [G. K. Paul.]
  - Locomotive. [Monarch.]
- WATER AND SMOKE Massed.
  - Simple.
    - Fire Box Tanks.
      - Plain Surface. [Crawford.]
      - Added Surface. [Hitchings.]
    - Water Stoves. [Little Giant.]
  - Complex.
    - Concentric Rings. [Pequot.]
    - Cylinders, with loops. [Stead's.]

recognize this fact by making such additions, yet the best of them do not have a proper proportion of surface per square foot of grate. In their simplest form, as a water stove, they are very useful for laundries, stables, etc., but these little stoves can hardly be considered heating boilers.

The serious defect about all these boilers is that the main body is all one casting and a small crack or defect, when developed, destroys the entire boiler.

There are two other types of boilers that should be mentioned before closing the list. One has alternate concentric rings of water, and of smoke, and is really a vertical tubular boiler, the shell itself being one large tube, and the other tubes being concentric inside it. If made of cast-iron this would seem to be a weak form of construction but will answer if shells are made thick enough. The other peculiar type is a vertical cylinder with surface added by water tubes leaving the cylinder and returning to it either by rectangles, by short loops or long coils. These boilers seem to reverse the usual principle of putting the fire inside the boiler and puts the boiler inside the fire. To be economical it is evident that the outside must be very thoroughly insulated with a non-conducting covering.

Leaving the boilers with this sketchy analysis, we should consider, before closing, their appendages and attachments. The most important of these is the grate.

A vast amount of ingenuity and invention has been expended upon the grates of the house-heating boilers, and the manufacturers have profited by the experience of the furnace makers, which is often their own, and produced a large variety of oscillating, rocking, shaking, vibrating, dumping, revolving, and otherwise performing grates which

HORIZONTAL TUBES CLOSED AT ONE END.

Althaus, F. D.	Sectional.	New York City.
American Heater Co.	America.	Beloit, Wis.
Baily & Baldwin	Novelty.	Pottstown, Pa.
Boynton Furnace Co.	House Warmer.	New York City.
Brown, R. F.	Unique.	Chicago.
Co-operative Foundry Co.	Bermuda.	Rochester, N. Y.
Hazelton Boiler Co.	Porcupine.	New York City.
Hedges, S. P	Hedges.	Greenport, N. Y.
Holland & Thompson Mfg. Co.	Holland.	St. Paul, Minn.
King, H. & Son.	King.	Corry, Pa.
McLain, J. H., Co.	Cambridge.	Canton, O.
Nason Mfg. Co.	Free End.	New York City.
Rohn & Ellicott.	Rohn.	Easton, Pa.
Vertical Tube Boiler.	Tube Boiler.	Long Island City, N. Y.
Walworth Mfg. Co.	Clay.	Boston.
Wilson Boiler Co.	Wilson.	Buffalo, N. Y.

HORIZONTAL OR INCLINED OPEN WATER TUBES.

Abendroth & Root.	Root's.	New York City.
Acme Boiler & Radiator Co.	Acme.	St. Paul, Minn.
Babcock & Wilcox Co.	Water Tube.	New York City.
Chapman H. M.	Chapman's Combine.	Chicago.
Chicago Auto. Boiler Co.	Chicago Auto.	Chicago.
Campbell & Zell.	Zell.	Baltimore, Md.
Copper Manifold Water Heater Co.	Copper Manifold.	Cleveland, O.
Cross, A. T.	Saunders.	Providence, R. I.
Eastman Steam Heating Co.	Eastman.	Rockland, Mass.
Electric Boiler Co.	Electric.	Rochester, N. Y.
Gill, John L., Jr.	Gill Patent.	Phila.
Harrisburg Boiler & Mfg. Co.	Star.	Harrisburg, Pa.
Hayes & Falls.	Torrent.	Rochester, N. Y.
Heine Safety Boiler Co.	Heine.	St. Louis, Mo.
Lewis Boiler Co.	Lewis.	Exeter, N. H., & Boston
Lortie, F.	Prefontaine.	Granville, Wash. Co., N. Y.
National W. T. Boiler Co.	National.	New Brunswick, N. J.
Portsmouth Mach. Co	Carman's.	Portsmouth, N. H.
Rutzler, E.	Blake's.	New York City.
Sawyer, N. F.	Sawyer.	Haverhill, Mass.
Schuylkill F'dry & Mach. Works.	Wood's.	Conshohocken, Pa.
Shackleton	Shackleton.	Not now made.
Smith & Winchester Co.	Winchester.	Boston.
Steel, Geo. P., Iron Co.	New Amer. Safety.	Phila.
Whitworth Heating Co.	Whitworth.	Worcester, Mass.

VERTICAL WATER TUBES.

Anderson-Asire Co.	Asire.	South Bend, Ind.
Aultman & Taylor Mach. Co.	Cahall.	Mansfield, O.
Baker & Shevlin.	B. & S.	Saratoga, N. Y.
Brake, A.	Brake's.	Toronto, Ont.
Culver, J. E.	Thermostatic.	Jersey City, N. J.
Mouat Heater Works.	Mouat.	Detroit, Mich.
Duplex Safety Boiler Co.	Duplex.	New York City.
Finlayson, A. W.	Finlayson.	Detroit, Mich.
Firmenich, J. G. & F.	Firmenich.	Buffalo, N. Y.
Fowle, A. H.	Champion.	Newark, N. J.
Head's Iron Foundry.	Little Giant.	Utica, N. Y.
Herbert, M. E. Heater Co.	Herbert Down Draft.	Chicago, Ill.
Hopson & Chapin.	Pequot Vertical.	New London, Conn.
Ideal Heater Co.	Phelp's Ideal.	Oskaloosa, Iowa.
Malcolm, R. J.	Malcolm's.	Milwaukee, Wis.
Otis Bros. & Co.	Water Tube.	New York City.
Peteler Furnace Co.	Peteler.	Minneapolis, Minn.
Rice Engine & Boiler Co.	Triumph.	Chicago.
Richardson & Morgan Co.	Cyclone.	New York City.
Richmond Stove Co.	Richmond Victor.	Norwich, Conn.
Silsby Mfg. Co.	Comfort.	Seneca Falls, N. Y.
Smith Patent Boiler Co.	Smith Patent.	Baltimore, Md.
Susquehanna S. Heater & Mfg. Co.	Sperl.	Susquehanna, Pa.
U. S. Heater Co.	Capitol.	Detroit, Mich.
Walworth Mfg. Co.	Howard.	Boston

DROP FLUE BOILERS.

American Boiler Co.	Bolton.	New York City.
Button Boiler Co.	Button	Waterford, N. Y.
Heads Iron Foundry	Standard.	Utica, N. Y.
Herendeen Mfg. Co	Furman.	Geneva, N. Y.
Johnson, F. T.	Hartford	Hartford, Conn.
LeBosquet Brothers.	New LeBosquet	Boston.
McLaughlin, G. T., & Co.	Drop tube	Boston.
Nason Mfg. Co.	Equator S.	New York City.
" "	Gulf Stream, H. W.	" " "
Raymond & Campbell Mfg Co.	Sun.	Middletown, Pa.

Remington Mach. Co.	Remington	Wilmington, Del.
Soleau, E. R.	Soleau's	Newark, N. J.
Windsor Heater Co	Windsor	Galena, Ill.

GOLD TYPE.

Carr, E. T	Carr	Miles City, Mon.
Eureka Steam Heating Co.	Plaxton	Rochester, N. Y.
Jewett, S. S., & Co.	Expert	Buffalo, N. Y.
Smith, H. B., & Co.	Gold	Westfield, Mass.
Steel, G. P., Iron Co.	Excelsior	Philadelphia.
Stover Heater Co	Cuba Horizontal	Freeport, Ill.
U. S. Heater Co	Capitol, H. W.	Detroit, Mich.
"	Hecla, Steam	

HORIZONTAL BOILERS WITH VERTICAL SECTIONS, SCREWED CONNECTIONS.

American Boiler Co.	Advance	New York City.
" " "	American	" " "
Basshor, T. C. & Co.	Lydie	Baltimore.
Boynton Furnace Co.	Boynton	New York.
Combination Flue Boiler Co.	Comb. Flue	Milwaukee, Wis.
Exeter Machine Works	Exeter	Exeter, N. H.
Foster F. W.	Improved	Boston.
Gates E. N. Heating Co.	Columbian	Fitchburg, Mass.
Gurney Heater Mfg. Co.	Double Crown	Boston.
Hart & Crouse	Royal	Chicago.
Hayes Pump & Planter Co.	Dach	"
Ingalls & Kendricken	Clogston	Boston, Mass.
Smith, H. B. Co,	Gold's Improved	Westfield, Mass.
" "	I X L	" "
" "	Mercer	" "
" "	Mills	" "
" "	O. K.	" "
Vanderman, Wm.	Sectional	Willimantic, Conn.

VERTICAL BOILERS WITH HORIZONTAL LAYERS.

Abendroth Brothers	Andrus	New York City.
American Boiler Co.	Florida	" " "
" " "	Soleil	" " "
" " "	Spence	" " "
" " "	Tropic	" " "
Boyce, A.	Boyce	St. Louis.
Brown, S. E., Heating Co.	Blodgett	Chicago.
Clark, Ansel	Avery	Norwich, Conn.
Columbian Construction Co.	Smith	Minneapolis, Minn.
Gates, E. N.	New Hot Water	Fitchburg, Mass.
Gold, E. E., & Co	Pulsifer	New York City.
Ideal Boiler Co.	Ideal	Chicago.
Lincoln, H. W., & Steam Heat. Co.	Superior	Central Falls, R. I.
Longard Bros.	Longard	Halifax, N. S.
McLain Co., J. H.	Humber & Harvard	Canton, O.
Model Heating Co.	Novelty	Phila.
Mulford Heater Co	Mulford	Galva, Ill.
Page, Wm. H., Boiler Co.	Volunteer	Norwich, Conn.
Pease, J. F., Furnace Co.	Pease	Syracuse, N. Y.
Pulsifer, F. H.	Auburn	Auburn, N. Y.
Putnam Foundry & Mach. Co.	Plummer	Putnam, Conn.
Redman & Byram	R. & B.	Fishkill Landing, N. Y.
Robb, John	Monarch	Akron, O.
St. Louis H. W. Heating Co.	St. Louis	St. Louis.
Smith & Anthony Stove Co.	Hub	Boston.
Smith, H. B., Co.	Globe	Westfield, Mass.
Steel, Geo. P., Iron Co.	Monitor	Phila.
Stover Heater Co	Cuba Vertical	Freeport, Ill.
Vanderman, Wm.	Triple Flue	Willimantic, Conn.
Wheeler, Russell & Son	Palace King	Utica, N. Y.

HORIZONTAL WATER BARS IN STRATA.

American Boiler Co.	Perfect	New York City.
Carmody, J. D.	New Idea	Evansville, Ind.
Geyser Heater Co.	Geyser	Rochester, N. Y.
Majestic M'f'g Co.	Majestic	St. Louis Mo.
McLain, J. H. Co.	Cambridge	Canton, O.
Mott, J. L., Iron Works	Sunray	New York City.
Walker & Pratt M'f'g Co.	Commonwealth	Boston.
Wilber Heater Co.	Wilber	Chicago.

CIRCULAR COIL BOILERS.

Annin & Co.	Moore's	Brooklyn, N. Y.
Auto. Safety B. & Eng. Co.	Trowbridge	New Haven, Conn.
Baker Smith & Co.	Car-heater	New York City.
Brock, A. D.	Brock's	Boston.
Catchpole, A.	Catchpole	Geneva, N. Y.
Clapp, M. R.	Coiled Tube	Hudson, N. Y.
Gurnee, P. G.	Gurnee	Kingston, N. Y.
Herreshoff Bros.	Herreshoff	Bristol, R. I.
Mahony, M.	Mahony	Troy, N. Y.
McKay, Alex.	Peter Smith	Detroit, Mich.
N. Y. S. Heater Co.		New York City.
Portland Heater Co.	Portland	Portland, Me.
Simmons, John	Burkhard	New York City.
Springfield Coil Boiler Co.	Springfield	Springfied, Mass.
Tobey, Wm. L.	Tobey	East Boston, Mass.
Union Brass M'f'g Co.	Searle	Chicago.
Ward, Charles.	Ward's	Charleston, W. Va.
Whitlock Coil Pipe Co.	American H. H.	Elmwood, Conn.

COILS WITH FITTINGS.

Almy Water Tube Boiler Co.	Almy	Providence, R. I.
Dimmick & Smith Mfg. Co.	D. & S.	Wilkesbarre, Pa.
Ducolin, S.	Ducolin	Norwood St. Law. Co. N. Y
Finlayson, A. W.	Finlayson	Detroit, Mich.
Garth, Chas., & Co.	Garth	Montreal, P. Q.
Gifford, J. J., & Co.	Park	New Bedford.
McLellan, Chas. T.	Little Wonder	Easton, Pa.
Roberts, Edward	Roberts	New York City.
Walworth Cons. & Supply Co.	Perkins	Boston.

HORIZONTAL FIRE TUBES.

Broomell, Schmidt & Co.	Our Own	York, Pa.
Devine, Peter	The Flat Top	Chicago.
McCormack, J. H.	McCormack	Wallingford, Conn.
McNeil, J. C.	McNeil	Akron, O.
Parmelee, E. S.	Side Flue	Wallingford, Conn.
Standard Car Heating Co.	Westinghouse	Pittsburg, Pa.
Vogt, Henry & Bros. M'f'g Co.	Vogt's	Brooklyn, N. Y.
Worcester Steam Boiler Works.	Allen	Worcester, Mass.

VERTICAL FIRE TUBES.

Allen, D. N.	Allen	Concord, N. H.
Allis, E. P	Reynolds	Milwaukee, Wis.
Baker, Smith & Co.	Portable	New York City.
Barron Steam Heating Co.	B—Perfection	New York City.
" " "	Ruskin, H. W.	" " "
" " "	Simplex	" " "
" " "	Stanley, F. T.	" " "
Bates, E. P.	Bates	New York and Syracuse.
Benjamin, J. C.	His Own	Bridgeport, Conn.
Complete Combination Co.	Post & Sawyer	Boston.
Connery, J. W.	Connery	Phila.
Davis, A. D.	Davis	Colorado Springs, Col.
Denslow & Jackson	Combination	
Dunning, W. B	Dunning	Geneva, N. Y.
Duplex Steam Heater Co.	American	New York City.
Ellis, C. R.	Ellis	New York City.
Eureka Steam Heating Co.	Eureka	Rochester, N. Y.
Ferguson Boiler Co.	Ferguson	Albany, N. Y.
Frey & Motter	Surface Burner	York, Pa.
Globe Steam Heater Co.	Globe	North Wales, Pa.
Gorton & Lidgerwood Co.	Gorton	New York City.
Henderson, J. C. & Co.	Henderson	Troy, N. Y.
Hobbs, Gordon & Co.	Concord	Concord, N. H.
LeBosquet Bros.	LeBosquet	Boston, Mass.
McGinness, Smith & Co.	Submerged Tubes	Pittsburgh, Pa.
Mitchell, John	Combustion chamb'r	Louisville, Ky.
Mott, J. L., Iron Works.	Demarest's	New York City.
Mt. Joy Steam Heater Co.	Lindemuth	Mt. Joy, Pa.
Patterson, H, & Co.	American Double	Albany, N. Y.
Pierce Steam Heating Co.	Excelsior	Buffalo, N. Y.
Ranton Boiler Co.	Ranton's	Syracuse, N. Y.
Raymond Furnace Co	Raymond	New York City.
Rutzler, E.	Nonpareil	New York City.
Silsby Mfg Co.	Silsby's Steel.	Seneca Falls, N. Y.
" " "	Comfort	" " "
Swamscot Mach. Co.	Swamscot	Boston, Mass.
Trimble & Lutz	Thermo	Wheeling, W. V.
Utica Steam Gauge Co.	Woods	Utica, N. Y.
Vail, S. S.	Reversible	Keokuk, Iowa.
Vanderman, Wm.	Duplex	Willimantic, Conn.
Victor Heating Co.	Victor	Norwich, Conn.
Weston Engine Co.	Bronson	Painted Post, N. Y.

LOCOMOTIVE TYPE.

Bruce, F. E	Mehring	Chicago.
Fitzgibbons, P.	Water Tube	Oswego, N. Y.
McAleenan & Co.	Monarch	Peoria, Ill.
Thatcher Furnace Co.	Champion	Newark, N. J.

FIREBOX TANKS.

American Boiler Co.	Modern	New York City.
Boynton Furnace Co.	Niagara	New York City.
Brown Rufus G.	Brown	Waltham, Mass.
Caswell, F. K., & Co.	Forced circulator	Hartford, Conn.
Combination Co.	All Right	Norwich, Conn.
Duplex Steam Heater Co.	Duplex, Auto.	New York City.
Ellis, Chas. R.	Small Ellis	New York City.
Fish, Hindle	Smith & Lynch	Boston.
Gorton & Lidgerwood Co.	Old Style Gorton	New York City.
Hay & Prentice	Pattern L	Chicago, Ill.
Hitchings & Co.	Corrugated	New York City.
" " "	Vertical B. B.	" " "
Lovegrove & Co	Schimpf	Phila.
Mahoney, M.	Direct	Troy, N. Y.
Putnam Foundry & Machine Co.	Return Flue	Putnam, Conn.
" " " " "	Leader	" "
" " " " "	Plummer	" "
March-Brownback Stove Co.	Crown	Pottstown, Pa.
McDonald, K	McDonald	Portland, Maine.
New Haven Steam Heating Co.	Old Style	New Haven, Conn.
Pentecost Steam Heating Co	Pentecost	Worcester, Mass.
Leader, Putnam		Putnam, Conn.
Scollay, John A.	Scollay, H. W.	Brooklyn, N. Y.
Smith, H. B., Co	Cottage	Westfield, Mass.
Thayer Heater Co	Thayer	Wollaston, Mass.
U. S. Heater Co	Mascot	Detroit, Mich.
Vanderman, Wm	Hercules	Willimantic, Conn.
" "	Sandow	" "
Walker & Pratt Mfg Co	Cranford	Boston.
Ware Auto. Heat Gen. & Reg. Co	Ware	Phila.
Weathered, T. W	Weathered	New York City.

HOT WATER STOVES.

American Boiler Co.	Little Giant	New York City.
	Small Perfect.	" " "
Comb. Stove & Water Heating Co.	Brewer	" " "
Goulds & Caldwell Co.	Caldwell	Chicago.
Hitchings & Co.	Domestic	New York City.
Herendeen Mfg. Co	Furman Jr.	Geneva, N. Y.
Ingram, W. H.	H. W. Stove	Phila.
Kearns Wro't Steel Range Co.	Kearns	Phila
Lynch & Woodward	Foxboro.	Boston.
Mahony, M.	Cooper, with coil	Troy, New York.
McLain, J. H., Co.	Yale and Sandow	Canton, O.
Rex Heating Co.	Rex	Norwich.
Rice Boiler & Engine Co.	Triumph	Chicago.
Smith & Anthony	Water Stove	Boston.
Walker & Pratt Mfg. Co.	Small Series	"
Wilks, S., Mfg. Co.	Wilks C. Stoves	Chicago.

CONCENTRIC RINGS.

Bell, Geo. H. & Co.	Peerless	New York City.
Canton Mfg. Co.	Columbia	Canton, O.
Herbert, M. E.	Herbert	St. Joseph, Mo.
Haxton S. Heater Co	Haxton	Kenawee, Ill.
Hopson & Chapin Mfg. Co.	Pequot Vertical	New London, Conn.
Nolan, W. E.	Nolan's	Brooklyn, N. Y.
Royal S. Heater Co.	Royal	Gardner, Mass.
Rubel & Co.	New Lily	Chicago.
Wheeler, Cyrus, Jr.	Wheeler	Auburn, N. Y.

TANKS WITH OUTSIDE LOOPS.

Crane, Geo. A.	Crane	Cleveland, O.
Central Falls S. H. Co.	Ramsbottom	Central Falls, R. I.
Clonbrock Steam Boiler Works.	Morrin Climax	Brooklyn, N. Y.
At one time by Ashcroft	Economical	Boston.
Snyder, W. B.	Snyder	New York City.
Stead, J. C.	Spiral	Brooklyn, N. Y.

FURNACES WITH WATER SURFACE SUPPLEMENTARY.

Boynton Furnace Co.	New Gas Light	New York City
Brown, R. F	Water Heater	Chicago.
Denny Bros. & Co.	McKay Comb	Newark, N. J.
Fuller & Warren Co.	F. & W.	Troy, N. Y.
Hart & Crouse	Prince Royal	Utica, N. Y.
Howard Furnace Co.	Combination	Syracuse, N. Y.
McDonald, T. A., & Co.	Combination	New York City.
Norcross Damper Reg. Co.	Combination	Boston.
Orr, Painter & Co.	Torrid Sunshine	Reading, Pa.
Pease, J. F., Furnace Co.	Economy	Syracuse.
Russell, Daniel	Russell's	Boston.
Rutzler, E.	Combination	New York City.
Simonds M'f'g Co.	Culver	New York City.

UNCLASSIFIED.

Dover Fdry. & Mach Co.	Challenge	Dover, N. H.
Joy Steam Heating Co.	Joy Stanton	Titusville, Pa.
Stanton, Henry		Flushing, O.
Harrison Safety Boiler Works.	Harrison	Phila.
Edgemoor Iron Works.	Galloway	Wilmington, Del.

A most marked improvement has been made in the last ten years in the external style and decoration of small boilers. As an example, ten years ago the Gurney was homely enough to scare a mule and its confréres were not far ahead of it in beauty. To-day by the aid of tasteful pattern making, decorative handles, dampers, and attachments, and a little nickel plate and fresh paint, the house-boiler captivates the purchaser at first sight, while artist and poet have been called in to ply their pencil and pen for the advertising literature of the enterprising makers. So have the dictionary and the Gazetteer been searched for catching appellatives for these children of American ingenuity, and captious must be the man or woman who, disregarding everything else, cannot find a name to suit them. A man can break himself with a "Brake" boiler or get broke with a "Broke," or instead of a mother-in-law he can have a "Torrent," a "Geyser" or a "Cyclone" in his house. So also he can choose between the climates of the "Equator," the "Tropics," "Bermuda," "Cuba," "Florida," the "Gulf Stream" or "Hecla." If a sun worshipper he can select the "Sun," the "Sun-ray," the "Soleil" or the "Torrid Sunshine." If a monarchist he can have a "Majestic," a "Monarch" or a "Royal Palace King" and a "Prince Royal;" while an enthusiastic American can buy a "National," "American Columbia" or "Commonwealth," and the sporty man can keep a "Champion," "Victor" or a "Mascot" in the house. At any rate anyone can have both "Comfort" and "Perfection" if he so wishes.

Leaving out the quotation marks this last statement is not far from true to-day, and the American house boiler takes its place by the side of those other necessities of our civilization, the harvester, the sewing-machine and the typewriter, as the tribute, of American brains to the comfort and convenience of our civilization.

A communication from Edward F. Keating of New York, inviting the members of the convention to visit his large establishment was read and placed on file, thanks being extended to Mr. Keating.

The further reading of papers was deferred, and the regular business was taken up, the convention going into executive session to receive the report of the ways and means committee.

THIRD DAY SESSION, JUNE 21.

The first matter to engage the attention of the convention, which was opened on the third day at 10:35 A.M. was a paper by D. M. Quay of Chicago on How to Benefit the Trade. Mr. Quay presented a very able paper and outlined business policies which if followed could not fail to be of benefit.

The following despatch from the National Association of Master Plumbers assembled at Detroit was then read:

Your telegram of congratulation received and the Twelfth Annual Convention of the National Association of Master Plumbers send greetings to the Sixth Annual Convention of the Master Steam and Hot Water Fitters.

Mr. Charles Barnett, as national representative of the National Association of Master Steam and Hot Water Fitters and Helpers, asked for the convention's indorsement of a bill having the following provisions:

SEC. 1. No manufacturers or employer in this commonwealth that have in their employ a person or persons whose duties are the care and operation of stationary (steam) engines or steam boilers, or both, shall exact from said employees any other work than the care of such engines and boilers.

SEC. 2. No person or persons whose occupation is the care and operation of steam engines and boilers shall, while in performance of that duty, perform any other work that will occasion them leaving their engine or boiler room.

SEC. 3. And manufacturers, corporations or persons violating any of the prohibitions of this act shall be punished by a fine of not less than $50 for each offense.

After Mr. Barnett had explained the object of the bill an animated discussion as to its merits and defects took place, the matter finally being referred to the incoming executive committee.

The Chair appointed a committee composed of the past presidents of the Association, to nominate candidates and to bring in recommendations as to the time and place of holding the next convention. Mr. E. P. Bates spoke in favor of holding the next meeting at a place where outside attractions were less of a feature than they are in large cities.

The report of the Committee on Standard Flanges being called for, Mr. E. P. Bates, the chairman of the committee, prefaced his remarks by explaining that the basis, so to speak, of a standard flange is the longitudinal line equidistant on either side of which the bolt holes must be drilled. The size of bolt holes and their number was discussed, Mr. Kendricken favoring the adoption of two flanges, one for steam piping and the other for valves, the former to contain such a number of bolt holes as would be a multiple of 3 instead of 4 as in the present standard. He said that the extensive introduction of the standard flange depended upon the manner in which the subject was brought to the attention of the contractors and fitters, and that every steam and hot water fitter, engineer, architect, and contractor should have in his possession at least one half-size drawing of the standard flange. He favored taxing the members of the association to defray the expense of printing such drawings. The subject of changing the standard to conform to the practice of some of the larger manufacturers was referred to the committee on Standard Flanges, with power to act, after a heated discussion, representatives of the Crane and Walworth companies explaining the advantages of the proposed changes, at least so far as they were concerned.

After the presentation of this report the convention adjourned until 9 A.M. on Friday, June 22.

MORNING SESSION, JUNE 22.

The convention came to order at 10 o'clock, and the report of the Committee on Permanent Headquarters, recommending the city of New York, was received and laid on the table, pending the report of the executive committee.

The executive committee then reported on the recommendation of the president for the adoption of a uniform contract. The report was referred to a special committee to report to the executive committee in 90 days, the executive committee having full power to act.

Reports from secretaries of local associations were then called for and were deferred for the executive session. The Committee on House Heating Boilers was called, but it was decided to hear the report in executive session.

Mr. Mills of Chicago introduced a resolution condemning the Smead system of dry closets in connection with the heating and ventilation of schools, and it was unanimously favored and referred to the executive committee for immediate action.

The convention then went into executive session.

AFTERNOON SESSION, JUNE 22.

The convention listened to a report of the Committee on Standard Flanges.

After consulting with a representative from American Society of Mechanical Engineers and committee of valve manufacturers it was decided to call a general conference of representatives from these bodies including the pipe manufacturers to meet July 18th. The committee report the matter as practically settled and think very few if any changes will be made, and urged the members to go on ordering in all cases "Standard Flanges."

The following is an abstract of a paper read by A. B. Franklin, of Boston, on

THE VALUE AND IMPORTANCE OF OUR NATIONAL ASSOCIATION.

MR. PRESIDENT AND FELLOW MEMBERS:—It seems hardly necessary that one should take the time of this convention to speak upon the value and importance of our National Association, but some are prone to think that if the benefits of an organization like ours are not constantly apparent, that they are not receiving the advantages expected, and consequently the Association loses its prestige among such; and others listen to the criticism of its management and have nothing to say in its defense.

Many of us have looked with pride upon the noble warships which comprise our White Squadron, and we know that our government is respected among the nations of the earth because of this efficient navy, whose very presence speaks of the power and authority of sixty millions of people. So, in some such sense, we may rightly say that our association stands for a body of men whose wishes are to be heeded, because of the fact that by our organization we are a power whose influence commands the respect and attention due us.

The work of the association is largely a preventative one. The very fact that we are an organization, and as individual members expect certain treatment at the hands of the manufacturers and their agents, is enough for them to so conduct their business as not to antagonize our interests.

We of the Massachusetts local are proud of the fact that we owe our very existence to the National Association, and had the conditions which existed before the visit to us of our National Secretary continued to this day, with the natural increase of the evils then prevailing, many of us would have been driven to the wall.

Now, I wish to say a word which I hope will, in some way, reach every member of our craft throughout the land; but first, I want to except the man who thinks he knows it all, who is perfectly satisfied with his condition, who never has an ambitious idea to improve his surroundings, or better provide for those dependent upon him, who knows that everyone of his competitors are knaves, and does not hesitate to say so, to such a one who has the above accomplishments. No human power or voice can reach or influence, but, to the live, thoughtful, progressive man, fully alert to all that is for his best interest, is it not time for you to do your part towards the upbuilding of an organization whose sole purpose is to afford you substantial benefits?

It is a fact that the largest and most influential firms in all our great cities are ardent supporters of this association and affirm more strongly to-day the value and advantages of our organization. Now, these firms from the position they occupy can do without the benefits referred to far better than the man doing a small business and located distant from the cities.

"Selfish" is a mean word to apply to any man, but to selfishness must be added the charge of meanness in the case of those men who are ready to accept all the benefits accruing by the labors of others and not lend either his financial or moral support.

But no great or lasting reforms for the benefit of the nation or society have ever been bestowed upon any body of men without labor and great sacrifice on the part of the few who, having an unselfish desire to benefit their fellow men, nobly assume the responsibility and bear the burden of criticism or of fault finding patiently and persistently until they receive the award of merit which is their due.

Few to-day realize with what sacrifice and labor our forefathers laid the foundation of this government. We are wont to think that the 4th of July, '76, witnessed the commencement and the completeness of our constitution. But listen, the union of the American colonies was suggested by Benj. Franklin at Albany in 1754, it was fostered by Massachusetts in 1765, further developed at Carpenters Hall, Philadelphia, 1774, effected at Independence Hall, Philadelphia, in 1776, then made more perfect Sept. 17th, 1787.

You readily see the steps of progress from what was first a suggestion to the full realization of the fact that we are a nation and destined to become the greatest of all powers. But the steps were slow and painful. Shall we not take courage and in the end arrive at that position to which the objects of our association entitle us? But there is much to be desired yet.

First, we want an enlarged membership. Every firm engaged in our craft should be shown the advantages of this organization and influenced to join. We should demand better and greatly increased protection from the manufacturers and their agents granting to us the legitimate profit due us as between consumer and contractor.

The need of establishing a rate of consumers' discounts and loyally sustaining by them on our part and insisting on the manufacturer doing likewise; a more hearty and unselfish support of our officers and greater loyalty to our organization, that the benefits proposed may be realized by every member; all these and much more may be obtained by a union of all, working together in harmony to obtain the most good for all.

We are met at this convention not only to review what has already been accomplished but to take such wise and positive action as shall place us in so strong a position that neither the carping of the critics nor the attacks of our enemies shall have any effect upon us, for we are formed for the sole purpose of uplifting our profession to a higher plane, through that mutual helpfulness which only a strong, noble, upright organization can secure to us.

Mr. John B. Farnsworth's paper on Early Reminiscenes in Hot Water Heating was then called for, but as it was late it was not read but was ordered to be printed. It is as follows:

EARLY REMINISCENCES IN HOT WATER HEATING.

On the 15th of June, 1890, I started, in company with a brother fitter, to see if we could learn something of the methods employed in heating by hot water. We visited in Harvard, Mass., a small two-story building of four rooms, two on each floor. The heating arrangement consisted of a medium sized upright cylinder stove, such as was used at that time to heat large rooms. Inside of this stove was an upright water tube boiler (or annular, so called) manufactured by Jonathan Johnson, of Lowell, Mass. It was made of two hollow cast-iron rings, about 15 inches in diameter, one at the top and the other at the bottom. A row of 1-inch upright pipes, about 13 inches long and 2 inches apart, extended from one of these rings to the other, leaving a space on one side of about six inches, so that the coal could be put in through the door. This boiler formed the fire pot, taking the place of the fire brick linings. The room on the first floor in which this stove or combination of stove and boiler was situated, obtained the least benefit of either of the four from the fire. The three other rooms were heated with coils of 1-inch pipe.

A small expansion tank was placed in the second story, and the water, after becoming heated, passed directly to the expansion tank or separator, and from there descended through the different coils and returned to the boiler. It was entirely new to me and the results secured from a moderate amount of coal seemed quite marvellous. I was quite favorably impressed with what I had seen and learned, and concluded that there was merit in it, which needed only to be more fully developed.

In the following August I visited Mr. Johnson at Lowell, who was conducting a series of experiments in hot water heating at his residence. He succeeded in making hot water travel through coils in different rooms on the same floor, first passing through one, then down into the basement and up into another, seemingly without regard to what we supposed were fixed laws. This astonished me.

About this time my brother Buerkel began to introduce Mr. Johnson's system of heating railroad cars by hot water. Baker & Smith of New York were also heating cars by their system, which was somewhat different.

In November I went to Boston and looked over several small jobs of hot water heating, some of which were put in by my friends, Smith & Anthony of that city. In December a Leominster gentleman called on me and said he understood I was investigating hot water heating, and wished me to heat his house if I thought I could make a success of it. I told him I was deeply interested in the subject and

thought I could do what he desired, although I had not tried it. I had confidence enough to put it into his house on condition that he need not pay for it until he was satisfied it was all right. Also, if it did not work all right and satisfactorily, I was to take it out without any expense to him.

I put in a Johnson boiler, 30 inches high by 22 inches in diameter, and pipe coils in four rooms. It was a complete success, even beyond my most sanguine expectations. About a week after the job was completed he came into my office and said he did not want it taken out, was perfectly satisfied, and paid me for the job before leaving. I was quite elated at this my first attempt.

Later on I changed the wall coils for Laflin radiators in the chambers, and put pipes under the floors to heat the two rooms on the first floor. The boiler continued to give satisfaction for about ten years, when I changed it for one of my own make, of which I will speak later. This job has always been satisfactory from first to last.

The only radiators I knew of then for hot water, were the Whittier, made by the H. B. Smith Co., and the Laflin, made at Westfield, Mass. I was told that hot water heating had been tried and abandoned fifty years ago. The furnace men laughed at the idea of heating by hot water; however, I didn't give it up, but kept right on.

In my next experiment I bought of Mr. Johnson one of his smaller heaters, 10 inches in diameter and 14 inches high, and placed it inside of an old sitting-room stove I had, and attempted to heat my shop, a room containing about 15,000 cubic feet. In my first trial I got so much pipe on that I could scarcely warm the water, so I took off about half of it, and it worked fairly well, considering what a small affair it was. After a time I got a larger size boiler of the same kind, which was quite an improvement.

The next April I put into a residence in Taunton, Mass., one of Mr. Johnson's boilers, in two parts, one inside of the other. The outer one was 22 inches in diameter by 30 inches high, and the smaller one was 15 inches in diameter and about 24 inches high, just coming down to the top of the feed door. I used the Laflin radiators on this job, and had the water flow up through a part of the radiators and down through the others. I vented the radiators with large pipes extending above the expansion tank. This house contained seven rooms, and was heated to 72 degrees with 1½ tons of coal per month during the winter of 1881-1882. This job has given the best of satisfaction. The first boiler lasted about six years, when another of the same kind was put in its place. This one lasted only about five years, and was replaced by a No. 3 Spence.

In November, 1881, I put a Johnson boiler into the American Express Company's office in Boston. The following December I went to Fall River, Mass., where I saw a job put in the Custom House and Post Office by Bartlett, Hayward & Co. of Baltimore, Md., and I noticed some points where I thought I could improve on that, even with my limited experience compared with theirs.

In February, 1882, I went to Portland, Me., to see Kenneth McDonald. He was making and using an upright cylinder boiler made of boiler iron, with about 1 inch of water space between the shells. This was surrounded by a sheet-iron jacket and set on a cast-iron base, arranged like a heating stove, with a direct and indirect draft. The coal was put in at the top, and the heat passed up through the boiler and down around the outside. I afterwards used several of these boilers with good results, and thought they were an improvement over the Johnson boiler. Mr. McDonald used box coils almost exclusively for heating.

I next tried a boiler made by Dr. I. Salmon of Boston, but did not like it. I do not remember it fully, but it was a small upright, with small brass tubes, more for a toy than for business.

I next tried a horizontal tubular boiler entirely filled with tubes. The heat passed first under the boiler, then back through part of the tubes, and returned to the rear through the remaining tubes. It was made similar to the Hawkins boiler of Springfield, Mass. This is still in use and works fairly well, but not up to my satisfaction. Later I tried to put in a cheap job (as I presume some of you may have done), consisting of a small boiler made by Walker & Pratt, and small radiators. During the mild weather in the fall it worked finely, but when the colder weather came on I could not heat the house. I changed this boiler for a Gurney, but could not do it with that. I wanted to put this under pressure, but the Gurney people would not allow me to do it. I then put in one made by E. N. Gates of Holyoke (and later of Fitchburg), and by running it under pressure I succeeded in heating the house. The Gates boiler was made of 3 inch pipe about 8 feet long, set in brick on a slight inclination, with the fire under the higher end.

I thought I could improve on the Gates boiler, so I designed and built several, using 1¼ inch pipe instead of 3 inch, and varying the arrangement very materially from his. There were some very good points about this, but I gave it up after a short time. I have since tried many different kinds of boilers, but have probably put in about twice as many of the Spence as of all the others put together. I find no trouble if the boilers and radiators are of sufficient capacity and properly put in. I know of but one hot water job of all I have put in that has not given good satisfaction and has not continued in use to the present time.

I have already alluded to the fact that the furnace men formerly ridiculed the idea of heating by hot water, but now nearly or quite all of them have a combination heater, and a hot water heater of their own, verifying the old saying that "straws show which way the wind blows."

I did not intend to bore you with so much of my personal experience, and I fear it has not been interesting, but after beginning to revive the memories of past years I hardly knew where to stop. I have only attempted to give you some idea of what I had to contend with in the earlier days of hot water heating in eastern Massachusetts. I hope others may have had better facilities for obtaining knowledge, but what I have gained was by hard-earned experience.

A vote of thanks was tendered all those who prepared and presented papers, and to the proprietor of the Hotel for his courtesy.

A letter of regret from the Cleveland local, stating that while they could not join the convention this year they hoped to be present at the next convention, was read.

Resolutions of regret and condolence were then passed on the death of the following members.

Herman Kroeschell of Chicago, Hozen Mooers of Milwaukee, I. Lincoln, Jr., of Chicago; Geo. Strong, President of Joliet (Ill.) local, and Wm. Costello of Boston.

The election of officers resulted in the following selections: President, H. D. Crane, Cincinnati, Ohio; vice-president at large, E. P. Bates, Syracuse, N. Y., treasurer, E. D. Smith, New York, N. Y, executive committee, J. L. Wells, New York, A. C. Walworth, Boston, W. P. Thompson, Philadelphia, John W. Danforth, Buffalo; F. A. Williams, New York; State vice-presidents, J.W. Mills, Chicago; James Curran, New York; John E. Chafer, Cleveland; Wm. E. Bartlett, Boston; E. H. Randall, Concord, N. H.; James N. Smith, Providence, R. I.; J. B. Hughes, St. Louis, Mo.; A. Gawthorp, Wilmington, Del.; Wm. Rogers, St. Paul, Minn.; Chas. W. Light, Saginaw, Mich; C. J. Reilly, Denver, Col.; J. H. Griffith, Spokane, Wash.; H. T. Aarons, Davenport, Iowa; Wm. K. Downey, Milwaukee, Wis.; J. H. Farrell, of Indianapolis, Ind.; sergeant-at-arms, H. A. R. Deitrich, So. Bethlehem, Pa.

The executive committee were given full power to fill vacancies either in the board or the vice-presidents of states.

All unfinished business was then referred to the incoming executive committee.

The convention then adjourned subject to the call of the executive committee.

The following is a list of delegates and firms who presented credentials entitling them to representation in the convention:

BUFFALO: John W. Danforth, John Whittet, representing Whittet, Barrett & Co. and proxy for Barnd & Geiger, W. A. Case & Son, Clark & Co., J. H. Ruckel & Co., and Robert Clark.

CHICAGO: C. H. Simmons (Theo. Jacobs Co.); John Davis (John Davis Co.); P. S. Hudson (Baker & Smith Co.), proxy for the Chicago Heating Co., Kroeschell Bros., John Woodman, W. D. O'Brien, Geo. C. Mickow & Co., Illinois Heating Co., F. W. Lamb & Co., and M G. Cragin; D. M. Quay (Wells & Newton), John W. Mills, L. H. Prentice Co., Geo. Mehring, and T. S. Daniels.

MILWAUKEE: Chas. B. Kruse (Kruse Heating Co.), proxy for Davies & Lowman and Cordes & Tries; W. K. Downey (H. Moorers & Co.), proxy for M. Coogan & Co., A. J. Lindeman & Hoverson Co., and Grassler & Gezelschap.

NEW YORK: E. Rutzler, E. D. Smith (Baker, Smith & Co.); J. L. Wells (Wells & Newton); S. J. Geoghegan (Gullis & Geoghegan); F. W. Williams (Blake & Williams); James Curran (Curran Mfg. Co.); Andrew Mercer (H. B. Smith Co.); Wm. S. Phillips (Phillips, Doup & Co.); Geo. H. Morris (Johnson & Morris); Fred K. Van Court (Bonner & Van Court); Ambrose E. Neal (John Neal's Sons); Peter Backus & Son, and C. Y. Beach.

MASSACHUSETTS: P. H. Kendricken (Ingalls & Kendricken), proxy for Walker, Pratt & Co.; A. C. Walworth (Walworth Construction Co.); J. F. Buerkel (J. F. Buerkel & Co.); A. E Kenrick (Kenrick Bros.); Wm. E. Bartlett (Nutter & Seabury); John C. Hunneman (Thayer Heater Co.); Daniel Russell (Isaac Coffin & Co.); John B. Farnsworth, A. B. Franklin, proxy for G. M. Parks; Wm. Smallman (Isaac Coffin & Co.); Lawrence E. Milleay; E. W. Fiske (Smith & Anthony Co.); H. W. Heath; H. C. Richardson; A. A. Sanborn.

PROVIDENCE: Geo. A. Jenks (Union Steam & Gas Pipe Co.); Henry F. Root (H. F. Root & Sons); F. Coggeshall; Don J. Husey, proxy for Capital Heater Co.; E. R. Bryant (Pawtucket Steam & Gas Pipe Co.); J. M. Smith (H. B. Smith Co.)

PHILADELPHIA: W. P. Thompson (Thompson Bros.); H. Reeves (Reeves & West); John C. B. Trachsel.

ST. LOUIS: John B. Hughes (Hughes & Stone), proxy for Globe Steam Heater Co., Doherty Bros., and Missouri Steam Heating Co.

CINCINNATTI: John L. Frisbie.

ISOLATED MEMBERS: Peter Fauve & Bro., Wilkesbarre, Pa.; Alfred Gawthrop of the Alfred Gawthrop & Bro. Co., Wilmington, Del.; John C. Brison, Brison Plumbing & Heating Co., Wilmington Del.; John Collis, Des Moines, Ia.; H. A. R. Deitrich, So. Bethlehem, Pa.; E. P. Bates, Syracuse, N. Y.

THE TRADE PRESS.

The trade press was represented by the following gentlemen:

H. C. Meyer, Jr., J. H. Foote of the Engineering Record.

John K. Allen of Domestic Engineering.

D. R. Coleman of the Plumber's Trade Journal.

A. O. Kittredge, E. G. Baltz, W. E. Partridge of the Sanitary Plumber.

Daniel Stern of the American Artisan.

John Roberts, P. G. Monroe of the Master Steam Fitter.

H. M. Swetland, L. H. Hart, C. Wadsworth of HEATING & VENTILATION.

CONVENTION AND OTHER NOTES.

The New York Central Iron Works were represented by their secretary Mr. E. N. Squires who gave away as souvenirs a useful little coin purse printed on which was "Good cents and dollars buy the Dunning boilers," also a sample bottle of peach blossom perfume for the ladies. The perfume is the latest by Lundburg, and can be had of Messrs. Ladd & Co., corner Church and Barclay streets, New York.

Messrs. A. H. Seabury and C. E. Nutter of Nutter & Seabury, Boston, who are doing the Majestic Hotel, New York, were among the early attendants.

The A. A. Griffing Iron Co. occupied spacious parlors on the first floor near the convention hall, and were represented by Thos. H. Williams (president), Leonard Elliott, L. B. Sherman, F. W. Somers, John B. De Barth, Charles A. Lathrop, Throop Mason, and J. B. Sabin. They were showing a line of Bundy direct and indirects, the duplex crescent in connection with the duplex base radiator, a full line of Littlefield steam traps, the new Bundy pipe hangers, radiator valves, radiator bronzes, hydro-thermometers, and the Powers regulator, of which they are Eastern agents. They also exhibited, in connection with their radiator, the comfort foot rest, made by A. J. Bennett of Woonsocket. The rooms were handsomely decorated with pictures of their works and a few of the large buildings where their product has been used. Their parlors were constantly full of visitors.

The American Radiator Company occupied Parlor A immediately opposite the elevator, and facing the dining room on the first floor. They were represented by that prince of hosts Joseph Bond (president), J. A. Goodrich, E. R. Pierce, W. H. Hill, C. A. Morton, Wm. P. Jenkins, Willis Gilpatrick, John Nichean, John R. Walker, and Edward C Bates. The company felt their goods were so thoroughly known that there was no necessity of making a complete exhibit except of new specialties, prominent among which were new 38-inch high Detroit flue radiators and some single sections of their extra high leg, adjustable carpet, and double tapping. These latter sections were elegantly decorated by the electro plater. The parlor walls were hung with framed photos and lithographs of many of the larger buildings which have been erected in the United States during the last four years in which the product of the company was used. In addition to this, in various places about the parlors were placed easels with pictures of other work, etc. Prominent among the pictures were photos of officers of the company in Chicago, New York, and Boston. Tropical plants were used in profusion in decorating the rooms in the center of which was an enormous mass of cut flowers which were freely distributed to all ladies and gentlemen. The beauty of the rooms and their coolness attracted many ladies and their escorts and the company was never at a loss for visitors.

The fitters were guests of the American Radiator Company on Tuesday evening, a large theater party being the entertainment offered.

The New York branch of the Croue Company kept open house in parlor 212. G. Frank Uhler, the New York manager, whom everybody knows and likes, acted as host. Mr. J. M. Uhler, Waldron Moore, and Frank N. Waine of the Chicago office made able assistants. Mr. J. B. Murphy, the secretary of the company, and A. F. Gartz, treasurer, were there also, as special representatives. On the walls of the parlor were pictures of their World's Fair exhibit, also of the ten branch houses which the company operate. A souvenir with a short history of the company and the many goods they manufacture, with illustrations of their different factories and branch offices, with a special illustration of their New York house, was given away to each visitor. Their rooms were the Mecca of all visitors.

The American Boiler Co. occupied parlor 217. No exhibit of boilers was made, but a full line of circulars of the many different kinds manufactured by them were shown. Thos. Crone, the New York manager, acted as host and supplied each caller with an American flag. He was ably assisted by Percival H. Seward, consulting engineer; W. F. Dugay of the Boston office; C. A. Campbell, Syracuse; W. H. Peterson, Philadelphia; Robt. H. Monroe, Pittsburgh; and O. H. Phelps, New York. W. K. Pierce, president, and C. V. Kellog, treasurer, beamed on the throng of visitors who called. *Entre nous*, did you get a fountain pen? Croue gave us one. It's fine.

The Dean Steam Pump Co. of Holyoke, Mass., was the only pump company showing their specialties. John Mulleny and Edwin S. Denise of the New York office looked after the company's interests in the right way, and explained carefully the merits of the four pumps on exhibition, and of all others manufactured by the company, to inquiring visitors. Special circulars of the large product of the company were also tendered to all.

The Kennedy Valve Company was represented by Daniel Kennedy, president, and Edward H. Koons, salesman, also Mr. Hartsfeld of the New York office. The company exhibited in the basement a most beauti-

ful line of valves and fittings. The exhibit was draped with the American flag, which was most appropriate. A large number of the valves shown were gold plated, being especially gotten up regardless of expense for this convention. The company deserve great praise for their enterprise, and the large orders which they have been receiving will probably be materially increased.

Thos. Adams, superintendent of the Harrisburgh Steam Heat & Power Co., was among the many present.

The Abram Cox Stove Co. of Philadelphia, Pa., was represented by A. C. Edgar and M. B. Moore. This company had in practical operation the new Novelty steam boiler in a court of the hotel. Some great results are claimed on actual tests of this boiler, under ordinary circumstances for instance, a test made May 28th, 1894, the pounds of water evaporated for each pound of coal was $13\frac{84}{100}$. Fitters would do well to examine this new bo ler.

The William H. Page Boiler Company of Norwich, Conn., exhibited in the basement a No. 8 Volunteer steam and a No. 8 Volunteer hot water, also a No. 1 hot water. The exhibit was in charge of G. W. Weymouth of the company, with Chas. V. Haynes of DuBois & Darrow assisting. The Volunteer is always popular.

The Boynton Furnace Co. did themselves proud, showing the largest line of boilers exhibited. They were located in the basement, and of course attracted a constant crowd of visitors. The boilers shown were No. 608 steam, hard coal; No. 506 steam, hard coal; No. 207 steam, soft coal; No. 23 hot water, small size; No. 36 hot water; No. 48 double. This company manufacture boilers in all sizes for work from 125 feet to 4,000 feet. They also had on exhibition the new Niagara No. 118 steam, which carries 125 feet of radiation and is used for small work, selling at a phenomenally low price. The company were represented by Major C. B. Boynton, A. B. Marshall, engineer; Chas. Armitage, and Joseph H. Smith of the mechanical department.

The Fowler Radiator Mfg. Co. was represented by A. H. Fowler, general manager, and John Waters, president. They exhibited, in the basement, showing the various styles of their semi-direct and direct flue 36, 30, 24, and 20 inches high. The company are meeting with much success in the sale of their radiators.

Smith & Winchester of Boston, were ably represented by N. E. Frost, who presented for the first time to the fitters the new Winchester boiler. In another part of this issue we give a few facts regarding it, and must say it presents an exquisite appearance, has all the features of a first-class boiler, and is bound to be a great seller.

The Richmond Stove Company gave away as souvenirs Peacock and Turtle ash receivers, and were given lots of "thank you's" by delighted recipients. The company made no exhibit, but were ably represented by Geo. W. Clark, B. E. Mallory, Frank Whitelaw of Norwich, and S. A. S. Moppett and W. F. Higgins, New York.

The Fuller & Warren Co., Troy, N. Y., were ably represented by R. S. Wood, secretary of the company, and J. J. Wilson of the Baltimore office. Their exhibit was in the basement, where a three-section combination warm air and water first attracted attention. The combination made by this company is adapted to all styles and sizes of their furnaces and has especial efficiency. The company also exhibited a No. 15 hot water boiler, of which a large number are in use in the Buffalo and Baltimore fire departments as superheaters, so that on call of fire steam can be made quickly. A No. 250 double section house heater with nipple connection, self-cleaning water ways, which will burn the worst kind of fuel, including slack, completed an exhibit of a most successful company in this line of work.

The Thayer Heater Co., of Boston, was represented by John C. Hunneman, general manager of the company. The company had on exhibition in the basement a No. 30 water top, indirect draft, good for 2,200 feet, a No. 12 indirect draft good for 250 feet, and a No. 9 direct draft, good for 100 feet. These ratings are low and can be relied upon. They also showed a line of Thayer's special hot water fittings, Y's, and tees, of their exclusive manufacture.

The Gurney Heater Mfg. Co. are always at the front, and this convention was no exception, at great expense. General Manager Fish placed in the basement a No. 4 and 5 steam boiler (the new one), a No. 305 hot water, one style B crown, some examples of the Gurney hot water radiators, and samples of the new Yale quintette hot water and steam radiators. All were most artistically decorated, and presented a fine appearance. This exhibit attracted even the ladies to the basement, and frequent knots of fair ones accompanied by escorts were to be seen hovering about, examining the many good features of this company's specialties. Manager Fish was ably assisted by Wm. T. Isaac, secretary; Charles Morrison, senior hustler; J. H. Forrest, I. G. James, and Jas. P. Shaup.

H. H. Lindemuth, representing Raymond & Campbell, arrived on his mule Tuesday morning. Immediately thereafter, as if by magic, there appeared in the basement one of the Sun boilers No. 2, handsomely enameled and truly a thing of beauty. Soon after signs lettered, "Under the Light of the Sun," "The Sun Lights the Way." etc., appeared, and taken altogether Lindemuth got there, even if he is small.

The Henry R. Worthington Co. is always well represented when John Drew attends a convention, and this time he outdid himself in doing the honors for his company. No special exhibit was made but a full line of circulars of the Worthington condensers, underwriters' fire pumps, brewery pumps, mining pumps, sugar refinery pumps, and water meters were given away to the many callers. The company occupied room 355, and Mr. Drew was ably assisted by L. D. Gumpert.

The Ideal Boiler Co. had on exhibition in the basement one of their new boilers, and also had the best stand in the hotel to exhibit a model of their boiler, and to greet their hosts of friends. Every one who called received a lucky coin and a little bag entitled, "Don't let the cat out of the bag." Both were very unique advertisements, and will be sent free to all fitters who could not attend, by mentioning this journal. Don't fail to get them. You will be delighted. The company was ably represented by Geo. Downe, president, Henry E. Jones, and W. A. Russell.

Timothy Kieley was there, having a prominent exhibit in the corridor of his positive acting pump governor, Eureka pressure regulator, standard trap, patent oil separator, back pressure valve, high pressure valve, Champion return steam trap, and Standard trap with double seat.

J. G. & G. R. Bolton were represented by Geo. H. Raymond, New York manager, the company showing a model of their heater in the corridors.

The sign outside room 354 read, "Hart & Crouse extend to all a 'Royal' welcome." Stepping inside, one was greeted with "More Royal heaters sold than any other. Why?"—and then W. M. Mackay grasped you by the hand and said "Hello," and perhaps you thought of just one reason anyway. The company had on exhibit models of their heaters, and were ably represented by their New York manager, W. M. Mackay, David Millar, and H. L. Anness.

The Mackay Mfg. Co., of Newark, N. J., exhibited a line of hot water valves, union elbows, thermometers, and altitude gauges, all of which were examined with great interest by the fitters.

Parlor 214 was where Jenkins Bros. had a stream of fitters calling. The room was neatly decorated with several different colored daisies presented by Mrs. Jenkins, which proved a most delightful contrast to other flowers used in the hotel. The company had on exhibit a line of standard flanges, which were adopted by the association at their last meeting, and were ably represented by A. B. Jenkins, J. D. Stiles, H. C. Logan, and W. H. Utz.

The Nason Mfg. Co. exhibited on the office floor their new shaking grate, which is very simple, easily put in, and made to fit any boiler or furnace. It will work on any kind of coal, and do away with the necessity of slice bars and dumping grates; no machinery or bolts and nuts to give way. They also showed models of the Equator and Gulf Stream boilers, and were well represented by Charles Yingling.

Considerable amusement was caused at the Madison Square Roof Garden Wednesday evening by the patent "blow ups" which were distributed by Mr. Frost of the Smith & Winchester Co., Boston.

At each turn of the stairs to the basement, the visitor was reminded by large display cards that the exhibit of Hub steam and hot water heaters by the Smith & Anthony Co. of Boston was to be found in the basement just at the left of the foot of the stairs. The company exhibited a sample of both their steam and hot water heaters, and the large number of visitors who stopped to examine the merits and specialties of those boilers as demonstrated by the representatives, Mr. E. W. Fiske and S. F. Terwilliger, would seem to indicate considerable interest taken in this exhibit. A very neat special invitation was given out, inviting the members to spend a portion of their leisure at the headquarters of the company, parlor 357, where their comfort was well looked after by the company's representatives.

The Standard Radiator Company of Buffalo made no exhibit. What's the use of it, when D. Paul Hughes is on deck? He is a veritable host in himself, and was greeted warmly by all present. Mr. Hughes says the sales of radiators by his company has been very satisfactory, and that the new goods put on the market this year by them have been very warmly received by the trade.

The H. B. Smith Company of Westfield, Mass., was represented by President J. R. Read and R. D. Reed of Westfield and Andrew Mercer of New York, the active work of receiving and entertaining their friends falling on R. D. If a vote were taken at any time as to who was the most popular man among the manufacturers, R. D. would have a large majority; that's why H. B. Smith & Co., in addition to the knowledge of the trade about their goods, do not have an exhibit.

Major E. R. Pierce, the New England manager of the American Radiator Co. gave the New England fitters a theater party Tuesday evening that was very enjoyable and appreciated.

On Wednesday evening the manufacturers entertained the fitters by a theatre party at Madison Square Roof Garden. A large party were present.

The exhibit of the Model Heating Co., in a court of the hotel, of their new steam boiler in actual operation, attracted many interested. A. C. Edgar, engineer, M. B. Moore, and E. E. Barto were present to do the honors. During the test of Tuesday, 73 per cent of the heat generated was utilized. The fire surface is presented to the fire in such a way that the peculiar construction of the arms abstract the heat at necessary points, throwing the volume to right and left, causing the combustion to impinge on all parts equally. The water ways are constructed so that the boiler has free circulation, which gives a steady water line. The boiler is made in nine sizes, from 175 to 1,000 feet.

The Master Steam Fitters of Newark are forming an association, and will start with forty members.

The new pumps of the Deane Pump Co., Holyoke, Mass., are showing especially the triplex pump, operated by belt from either electric motor or power shaft, or by belted gear, or both. These pumps are for house and elevator service, a special application in New York city being its attachment to an electric motor and pumping water to large tanks on old buildings, thus lessening the risk in case of fire.

The Gurney Heater Mfg. Co. gave away as a souvenir a neat pocket memorandum book containing much valuable information to fitters, and a copy of it was appreciated by all of those who received one. Perhaps you can get one yet if you mention H. & V.

The Trimont Mfg. Co., of Roxbury, Mass., was represented by J. M. Hall, whose exhibit occupied a prominent place in parlor 338. Their line of Trimo chain wrenches, nipple holders, and combination wrenches attracted unusual attention.

J. E. Sweeting, the tall sycamore of the Wabash (or some other good river), did the honors for the Hilts Wrench and Paper Cutter Co., exhibiting his old stand-by Hilts wrench, in room 338. It wasn't half as hard for him now as it has been heretofore, as they a know the wrench and use it.

E. F. Keating, of New York and everywhere, was represented by Commodore Keating himself, J. T. Keating, Thos. Lang, Wm. Smith, and Jacob Irlbacher in parlor 338. Samples of Beaton's patent floor and ceiling plates (for which they are New York State agents), Brown's steam traps, Marsh air valves, the new Hoey & Conner condenser head, and a general line of valves, fittings, and tees were shown. The comfort of all visitors was looked after carefully.

Parlor 330 was occupied by the Walworth Mfg. Co. of Boston, who, regardless of expense, brought to the convention a part of their World's Fair exhibit of valves and fittings. Besides this they exhibited the Ashley patent right and left nipple holder, a big line of steam fitters' tools, Walworth gate valves, and millers' patent tools for cutting and threading pipe. This company is also selling agent for the new foot or tank valves, which are considered the best thing of their kind ever put on the market. It is not generally known, but it may be interesting to our readers to state, that the Walworth Mfg. Co. are the largest consumers of crucible steel in the world, and their tolls are now sold all over the world, the company having distributing offices in London and Bremen. Geo. T. Coppins, secretary, W. P. F. Ayer, New York state representative, and F. P. Keane of the New York office, did the honors and as usual did them well.

Norman Whitelaw and Chas. F. Hauss arrived Wednesday, and the Richmond Stove Co.'s hustlers were then all there. At their rooms a beautiful souvenir, showing pictures of their factories and half-tone cuts of their extensive line, which covers the greater range of work built on one principle of any company in the field, was given to all callers.

Blake & Williams were represented by J. L. McMahon, who took pleasure in showing all callers at room 341, Blake's improved malleable iron pipe hangers, Blake's thermostat, etc.

C. S. Hopkins did the honors for the Electric Boiler Co., arriving Wednesday morning. He doesn't say much, but keeps on working all the while, and lots of orders are coming their way we understand.

The Herendeen Mfg. Co. of Geneva made no exhibit, but gave away pencils (good ones) and a coin puzzle, also a card case souvenirs which is a very handy pocket piece. Fans, which were awfully handy, were also another gift by the company, who were well represented by F. A. Herendeen, secretary, J. T. Dudley, A. H. Dudley, J. W. Fowler, and E. K. Barr, of the Philadelphia office.

Mr. O. H. Phelps of the American Boiler Co. was one of the most popular men at the convention. Mr. Phelps has a host of friends, and took great pleasure in looking after the comfort of them all.

The Niagara Radiator Co. of Buffalo were represented by Geo. H. Howard, president, and Chas. F. Walther, vice president and manager. They had on exhibition in the basement one of their new radiators, which attracted much attention. They are also in the market with an indirect radiator, pin surface, each section 42 inches long and 10 inches wide, containing 16 feet of heating surface, with smooth nipple connections and diagonal corners. The company have just completed a new foundry at North Tonawanda, N. Y., and are now ready for business.

Somebody pulled one of the limbs of the secretary of the New York Central Iron Works so bad at the convention that he was very lame and had to use a cane. Who did it? that's the question. Don't all answer at once.

The United States Heater Co. of Detroit was represented by Col. John H. Mills of the Chicago office, who occupied parlor 323 and gave away a beautiful souvenir matchbox of polished wood, on which appeared the motto of the company in horseshoe form, "Capitol Luck." The names of the heaters made by the company—Capitol, Hecla, and Mascot—and the company's offices—Detroit, Chicago, and Boston—were also engraved on the box in gilt lettering. Col. Mills circulated around among them all, and did lots of hard pushing for his company.

The J. H. McLain Co. of Canton, O., occupied parlors 208, and 209, where the first issue of a new and beautiful catalogue was distributed. This catalogue is a work of art, printed in several colors, without regard to expense, the company deeming their most excellent line of goods deserving of it. In the basement the company exhibited the Canton heaters, Humber, Howard, Yale, and Sandow for water, and Cambridge for steam. The location of their exhibit was a prominent one and attracted much attention, and the various heaters were commented on most favorably. The company was represented by Frank C. McLain, general manager, Canton, Ohio; D. R. McCallum of New York, and James K. Peacock of Canton.

The Compound Radiator Valve Co. of New York was represented by James H. Hutchinson manager, who distributed circulars and exhibited samples of their new valves recently illustrated in this journal. This valve is designed to do away with the annoyance and dangers of flooded floors, requiring no looking after, simply to turn the steam on and off in the usual way.

Mr. M. B. Moore, who recently resigned from the service of the Boynton Furnace Co., will in future be connected with the Model Heating Co. of Philadelphia. Mr. Moore is well known in the trade, among which he has a large and valuable acquaintance, and we bespeak continued success for him.

Gerstendorfer Bros. of 17 Barclay street, New York, was represented by Chas. H. Engel, who distributed cards showing their large factories in Fuerth, Veldon, Simmetsdorf and Ranhenstein, Bavaria, Germany.

The representatives of the American Boiler Co., used a peculiar cheer to distinguish themselves from the ordinary crowd on the Glen Island trip. It ran something like this. "Who are we, Who are we, The American Boiler Company. With a hippoo, hippo, hippo, hip, its just as plain as plain can be, the company that leads is the A. B. C. With a hippo, hippo hippoo hip."

The decorating of most of the radiators and boilers was done by James Croke of Boston. Mr. Croke is a past master ot this art, and his work was most favorably commented on.

The Buckeye Iron and Brass Works of Dayton, Ohio, was represented by J. H. Eckert, whose exhibit in the corridor of the hotel attracted much attention. A line of radiator valves with Jenkins disks and brass disks, all differently finished in oxidized old copper and barbuffed, making a variety larger than shown by other exhibitors. The style and workmanship were also very favorably commented upon.

Batt, Bonnell & Thompson of 36 Dey street, New York, were represented by C. F. Batt and Mr. Nelson. They had on exhibition in the corridor a line of Nelson's patent compensating disks, which act in the manner of a universal joint, showing a tight valve under all conditions. There is also a double stuffing box whereby leaking around the stem is fully avoided. These valves are equally good under high and low pressure and have been very favorably received.

Geo. H. Bell & Co., of New York city, manufacturers of the Peerless boiler, were represented by Geo. H. Bell, who distributed catalogues and explained the merits of their goods.

Mr. T. G. Haywood, formerly of the American Radiator Co., will represent the Niagara Radiator Co. in Chicago and the West hereafter.

Mr. C. S. Hopkins of the Electric Boiler Co. of Rochester, N. Y., made several contracts for large size boilers while at the convention.

J. W. Fowler of the Fowler Radiator Co. wore an especially happy smile Thursday night. He said orders did it.

There were about 300 at the Roof Garden Wednesday evening.

Just 372 happy mortals took coaches from the hotel about 1.30 P. M. Thursday, leaving the dock at West 11th street at 2.10 on an especially chartered boat, the Laura M. Starin, for Starin's Glen Island. The trip around under Brooklyn Bridge and up the East River, passing Blackwell's, Ward's, and other islands, and allowing a magnificent view of the only American city, was heartily enjoyed by every one. A band especially engaged discoursed delightful strains, and the party arrived at the island about 4.45 P. M. After visiting the various features of interest, including the zoo, aviary and Little Germany, and listening to the concert furnished by the 71st Regiment band, all repaired to the Grand Café where an old fashioned New England clam bake was served. Following this Maj. E. R. Pierce was introduced, and with a few chosen remarks stated how delighted the manufacturers had been to extend this hospitality to the fitters and their appreciation of its acceptance. The major referred to the fact that since the fitters had acted in concert in relation to the cutting of prices they had been able to pay 100 cents on the dollar much easier, and always earned it. E. Rutzler, president, responded, thanking the manufacturers and stating their enjoyment of all hospitalities shown.

Geo T. Coppens was then introduced as Toastmaster. The first toast was "The Master Steam and Hot Water Fitters of the United States," responded to by A. B. Franklin of Boston, who spoke of the power of organization for one cause, that of helping one another instead of trying to injure one another, touched on the benefits of the association, etc. "The New York Local Association" was responded to by J. L. Wells of Wells & Newton, who told a story very effectively to illustrate his point "Our guest from England," was responded to by D. M. Nesbit of London, who expressed his feelings of gratitude for the cordial welcome extended to him and gave a cordial invitation to all fitters to visit England. Mr. Nesbit said he agreed with the objects of the association, and should hope to see an organization in England like it. "The Ladies" was responded to by D. M. Quay of Chicago, who spoke very feelingly of the part women took in molding the character of the future man, and of her loving and affectionate tenderness. The party arrived safely at the hotel at 10.30, tired, but happy.

The Thatcher Furnace Co., 240 Water street, New York, exhibited one of their champion steam heaters in the basement. The Chapion is designed to burn hard or soft coal, wood, gas, or oil, and is made in 12 sizes varying in capacity from 150 to 2,000 square feet of direct radiation.

The Springfield (Mass.) Coil Boiler Co., 48 Hamden street, was represented by J. L. Guyon, who exhibited a small boiler in the basement. The manufacturers claim nine points in which their heaters excel, and those who so desire will be furnished with the literature with which they substantiate their claims.

The Compound Radiator Valve Co., 569 West street, New York, was represented by their manager, James H. Hutchinson. The compound radiator valve of which Mr. Hutchinson is the inventor, was described in this paper last month. It is designed to secure a positive and complete circulation by introducing the steam into the radiator at both ends at the same time, it being necessary to use but one valve for each radiator.

The Kewanee (Ill.) Boiler Co. was represented by J. H. Dugar of the company's Chicago office. The company made no exhibit but some very well printed catalogues "showing up" the "Haxtum" in good shape were liberally distributed.

The Pacific Mfg. Co., 471-473 Eighteenth street, Brooklyn, N. Y., distributed some very tasteful catalogues descriptive of the large variety of Nelson valves which they manufacture, but made no exhibit.

The Eaton, Cole & Burnham Co., 61 Beekman street, New York, exhibited one of their pipe-threading machines in the basement of the hotel. This company is one of the largest manufacturers of pipe-threading tools, and if you are interested in this class of machinery send for their circulars.

"Revolutionary" teachings, as stated in an attractive little circular which the Walworth Mfg. Co., of Boston, distributed at the convention, are such as aim to overturn and supplant existing ideas and institutions, and to offer as a substitute something presumably better. The Foster "F.—P." ball valve which the circular describes is the first of an extensive line of plumbing specialties which the company will soon pace on the market.

The Geo. P. Steele Iron Co., 817 Filbert street, Philadelphia, distributed a well illustrated catalogue and price list of the Monitor, American, and Excelsior boilers and the Kensington and Grove radiators. A number of testimonial letters which are printed in the catalogue give evidence of the satisfaction with which the company's apparatus is regarded by its users.

An interesting feature of the manufacturers' exhibit was the new boiler shown by the Model Heating Co. The boiler was fired up to demonstrate some of the remarkable claims for it, and was fitted with pyrometers and thermometers. With a fire box temperature of 600 degrees F., they were able to make steam and at the same time their smoke pipe gases were reduced as low as 176 degrees. It was explained that the cooler water in the boiler was kept in contact with the gases at or near their discharge from the boiler, but when on request the feed water was shut off for 15 minutes, the escaping gases were only raised to 191 degrees. The writer concluded that the low temperature was reached by radiation to the air, as the discharge flue encircling the boiler was very large and entirely unprotected. The manufacturers contend that a heavy jacketing would not materially hange the condition, but will make a test and state he results. They were also distributing reports of a test which showed an evaporation of 13$\frac{8}{10}$ pounds of water at 62 degrees per pound of fuel burned. Both these statements are sufficiently remarkable to warrant a more careful inquiry and we shall hope to furnish further information regarding this boiler.

The manufacturers at the convention held a meeting on the second day and appointed a committee of entertainment composed of L. B. Sherman of the A. A. Griffing Iron Co., R. D. Reed of the H. B. Smith Co. and J. D. Stiles of Jenkins Bros. The finance committee was composed of A. F. Gantz of the Crane Co., F. A. Herendeen of the Herendeen Mfg. Co., Geo. T. Coppins of the Walworth Mfg. Co., Geo. Downe of the Ideal Boiler Co., W. H. Hill of the American Radiator Co., C. A. Lathrop of the A. A. Griffing Co. and D. Paul Hughes of the Standard Radiator Co. The motion that each manufacturer should contribute $50 was carried, it being understood that only those subscribing this amount would receive a share of the rebate if any. Judging from the manner in which the members and their friends were entertained there was no rebate.

Mr. Joseph De Rycke of 145 Broadway, New York, distributed circulars on the Peerless centrifugal condensing exhaust head and the feed water heater and purifier, with which some remarkable results have been shown.

The Star Brass Mfg. Co. of Boston, distributed circulars of the Star non-corrosive steam gauges, improved single spring, Bourdon pressure and vacuum gauges, pop safety valves, etc.

The following is a list of the ladies present at the convention: Mrs. H. W. Newel, Worcester, Mass.; Mrs. J. P. Shoop, Canton, O.; Mrs. J. D. Stiles, Huntington, Mo.; Miss Else Gray, London, Eng.; Miss Minnie C. Gawthrog, Wilmington, Del.; Mrs. E. D. Smith, Elizabeth, N. J.; Mrs. H. H. Lindemuth, Harrisburg, Pa.; Mrs. A. E. Kenrick and Miss Mariette, Kenrick, Brookline, Mass.; Mrs. G. W. Clark, Norwich, Conn.; Mrs. Norman Whitelaw, Norwich, Conn.; Mrs. E. C. Bates, Mrs. C. H. Simmons, and Mrs. J. P. Dugger of Chicago; Mrs. J. A. Fish, Mrs. J. N. Longley, Mrs. J. F. Buerkel, Mrs. F. W. Foster, Mrs. C. J. Bartlelt. Mrs. A. B. Franklin, Mrs. D. Russell, Mrs. A. G. Paul and Mrs. A. C. Walworth of Boston; Mrs. D. M. Nesbit, London, Eng.; Mrs. H. W. Heath, Lynn, Mass.; Mrs. E. N. Squires and Miss Bessie Squires, Geneva, N. Y.; Mrs. E. Rutzler and Miss Emma M. Rutzler, Mrs. John J Smith, Mrs. Geo. H. Reynolds, Mrs Leslie Daniels, Mrs. J. Curran, Mrs. W. R. Aarons of New York City; Mrs. Chas. Yunjhing, Metuchen, N. J.; Mrs. John W. Danforth, Buffalo, N. Y.; Mrs. Will Clark, Lebanon, Pa.; Mrs. Frank Thompson, New York; Mrs W. T. Smallman, Boston, Mass.

The ladies, in expressing their appreciation of the provisions for their enjoyment, adopted the following:

We, the ladies in attendance at the Sixth Annual Convention of the Master Steam and Hot Water Fitters' Association of the United States, wish to express our sincere and heartfelt thanks to all who have so kindly entertained us, for the great courtesy and attention that has been shown us, for the beautiful flowers, the pleasant drives, and the most delightful excursion to Glen Island. We hope for the continued prosperity of the association, and that we may all meet many times more.

"The Haxtun" was the title of a pretty souvenir book given out at the convention by the Kewanee Boiler Co. of Chicago, giving a full description of the goods manufactured by them and a few of the many residences and other buildings heated by them.

W. A. M. Grier, president, represented the Corry Radiator Co. at the convention, and reported that his company was running full on orders.

Many persons interested in heating and ventillation have been surprised by a circular issued by the Smith Heating & Ventilating Co. of Boston, giving notice of the discharge of their manager, Mr. Fred P. Smith, and stating that they proposed to continue the business as before. The company, as we understand it, is based upon the patents of Mr. Smith, whom we believe is still its vice-president and largest individual stockholder. Mr. Smith states that the so called discharge was subsequent to his having discharged the company. The fight, for such it seems to be, is really for the purpose of wrecking the company, each party seeking to obtain control of the manufacture of the ventilating fans and other apparatus.

At a recent meeting of the stockholders of the Gurney Hot Water Heater Co. of Boston, Mass., it was unanimously voted to change the name of the company to the Gurney Heater Mfg. Co. in order to specify more fully and broadly the field of its future operations, the company having taken up the manufacture of steam boilers and steam radiation. The officers of the company are: president, Edward Gurney; vice-president, John A. Fish; treasurer, John M. Paisley; secretary, William T. Isaac. It is the hope of the company that under its new title its many customers will contribute in broadening in fact its operations and on the part of the company superior goods with prompt and efficient service is assured.

The Powers Duplex Regulator Co. of Chicago, has just been awarded the contract for its system of heat regulation in the Van Dyke school at Detroit, Mich., a 16-room building to be erected this fall. It is said that the Powers system is being very favorably received by school boards elsewhere.

The Niagara Radiator Co., of Buffalo, N. Y., who made handsome exhibits of their new steam and hot water radiators at the Master Steam Fitters' Convention in New York and at the Plumbers' Convention at Detroit, have engaged Mr. T. G. Haywood, late of the American Radiator Co., to hustle for them in the West, with headquarters at Chicago, Ill. Mr. W. A. Russell will look after their trade in the East, with headquarters at New York. Niagara radiators have found great favor with both trade and public, and it looks as if the firm would have their hands full to supply the demand for their goods.

The Chicago Fire Proof Covering Co., 48-50 Franklin street, Chicago, Ill., have been awarded the contract for the large amount of steam pipe and boiler coverings required by the new State asylum, Kalamazoo, Mich., their champion mineral wool sectional covering being the winner. On behalf of the asylum the engineering department of the University of Michigan made a most thorough test of the 20 or 30 competing coverings, and this fact makes the award a very strong indorsement of the quality of the covering accepted. This firm also make the Ideal asbestos moulded sectional coverings, a large quantity of which they shipped on United States Government contracts. Their new factory at Summerdale (Chicago), Ill., is said to be the largest of its kind in the country, an increasing demand making it necessary for them to vacate tneir old quarters.

The Abendroth & Root Mfg. Co., 28 Cliff street New York, have issued for gratuitous distribution some finely illustrated trade literature presenting a fund of valuable facts regarding water tube steam boilers in general and the improved Root water tube boiler in particular. Architects, engineers and others who desire a large boiler capacity in a small space, should write to the company for their information Pamphlet No 3.

A very pleasant home gathering was that of the agents of the Abendroth & Root Manufacturing Co. during the week of June 15th at the company's offices in New York. This gathering was for the dissemination of full information regarding the company's manufacture of their well known specialties, and for the government of their business during the coming year. A dinner at the Fulton Club was given by the company Wednesday, June 13th. There were present P. M. Mehan, general sales agent, New York; Mr. Warren, also of the sales department, New York; Chas. E. Ashcraft, Boston, Mass.

George K. Hooper, late of Rochester, but who has now been transferred to the Chicago office; Alexander Lewis of Cincinnati, O.; besides John Abendroth, Howard Abendroth, W. H. Leitch, officials; Mr. Salter, counsel; Mr. Rice, superintendent, and Albert A. Cary, chief engineer. All reported progress in the introduction of the well-known Root Boilers, and voted the meeting a most valuable and instructive one.

The annual meeting of the Massachusetts Master Steam and Hot Water Fitters' Association was held atthe American House, Boston, May 31st, and the following officers were elected: President, Paul H. Kendricken; vice-president, John F. Buerkel; secretary, F. W. Foster; treasurer, Albert E. Kenrick; trustees, Arthur C. Walworth, Albert B. Franklin, Joseph A. Ingalls; investigating committee, Wm. E. Bartlett, Chas. F. Whittemore, John E. Hunneman; committee on new members, Wm. Smallman, John E. Lynch, H. W. Heath.

The American Radiator Co. send us a copy of their pocket catalogue for 1894. The catalogue is one that will be very valuable to the fitter for handy reference. The assortment of radiators offered the trade covers an experience of over a quarter of a century, and represents the acme of all the skill and ability that modern science is able to produce. The company's several plants cover an area of over 20 acres, and their foreign trade is very gratifying and largely on the increase,

The general offices of the American Circular Loom Co. have been removed from 620 Atlantic avenue, Boston, to the factory, Highland and Suffolk streets, Chelsea, Mass.

Mr. J. J. Sweeney is now in charge of the business of the Magee Furnace Co. at 242 Water street, New York. Mr. Sweeny is a hustler and deserves a good share of the trade.

J. J. Stephens, who represents the Carton Furnace Co. in Boston, has removed from 107 Blackstone to 85 Union street, where he is showing a fine line of furnaces, stoves, etc.

Le Bosquet Brothers of Boston are still catching the trade, and have lately placed their apparatus in Middleboro, Plymouth, Boston, and Winthrop, and are making many estimates.

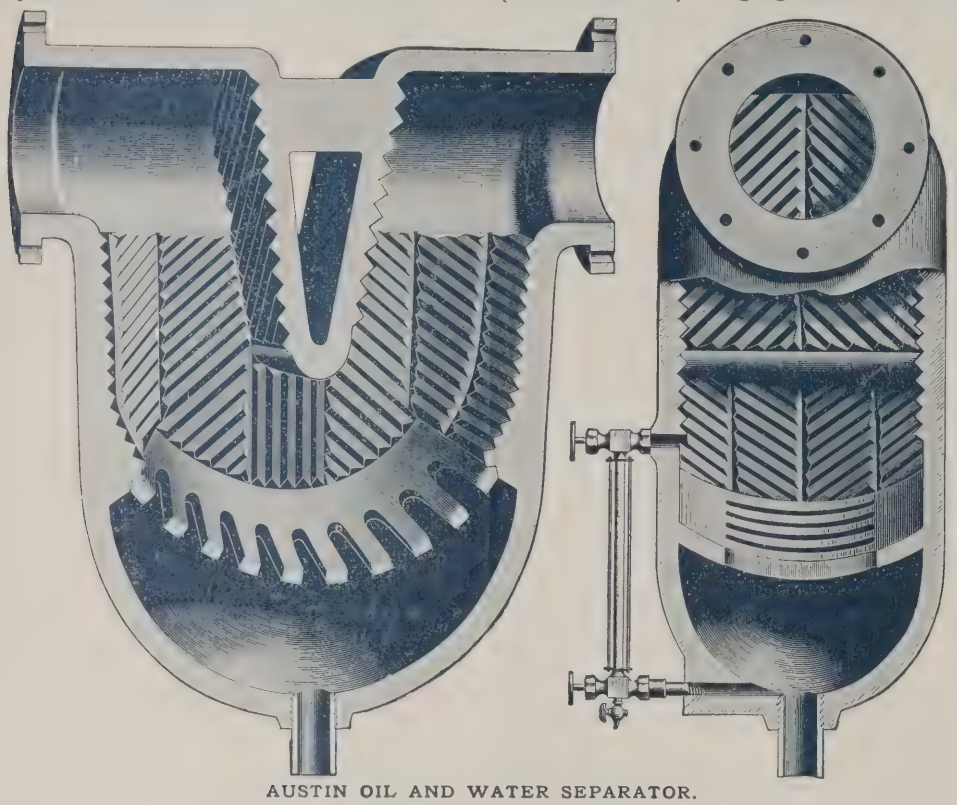
C. F. Fischer of 1334 Park street, Alameda, Cal., has secured the contract for the hot water heating system to be put in C. D. Postels' and A. S Sayles' new residences now building in Alameda. He will use Humber heaters and Holland radiators.

The following residences will be heated by the Windsor hot water heaters: Louis Homrich, Galena, Ills., Mrs. May E. Fitch, Savanna, Ill.; Joseph M. Roe, Oneida, Ill.

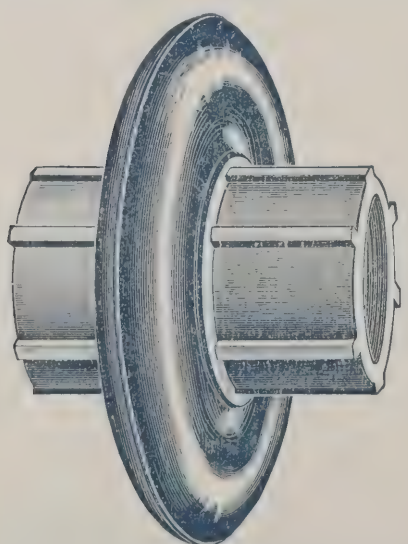
The New England Engineering Co., of Boston, who are introducing the "Paul" system, are sending out a unique folder which in explanation says the one object is to invite correspondence from parties operating steam plants of all sizes and who recognize themselves as willing to be convinced of the company's ability to effect a large saving in the item of fuel, or at least willing to afford them an opportunity to establish (to their entire satisfaction) their claims. We wish all our readers would investigate this system.

AUSTIN OIL AND WATER SEPARATOR.

This device is the invention of Mr. Eugene Austin, who was for many years connected with the Atlas Engine Works of Indianapolis, and who has of later years been the mechanical engineer of the C. C. Wormer Machinery Co. of Detroit, having charge of the engine and boiler department. We present herewith two sectional and an exterior view of the separator, which will convey an accurate idea of its construction. In passing from the inlet to the outlet the steam is deflected from its course by a corrugated deflector, and compelled to pass first downward and then upward through a corrugated channel in such a way that any impurities or water of condensation which may escape the corrugations are extracted by centrifugal force assisted by gravity while passing over the separating plate at the bottom. The grooves which drain the corrugations lead directly to the separating plate, from the chamber beneath which all accumulations may be removed as occasion requires. A gauge glass shows at all times the condition of the lower chamber. The separator is made in sizes (of connections) ranging from 1 inch to 8 inch, by the Austin Separator Co., Detroit, Mich.



AUSTIN OIL AND WATER SEPARATOR.



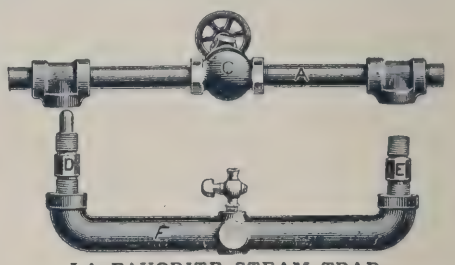
BUNDY MAJOR ELASTIC COUPLING.

BUNDY MAJOR ELASTIC COUPLING

The manufacturers claim that the coupling shown by the accompanying cut will absorb all the expansion and contraction of steam pipes incident to alternate heat and cold, and that it is therefore specially adapted for pipe fitting in high buildings or where there is a long, straight run of pipe, thus obviating the necessity of using G or S-shaped connections to take up the expansion and contraction. The A. A. Griffing Iron Co., Jersey City, N. J., manufacturers.

LA FAVORITE STEAM TRAP.

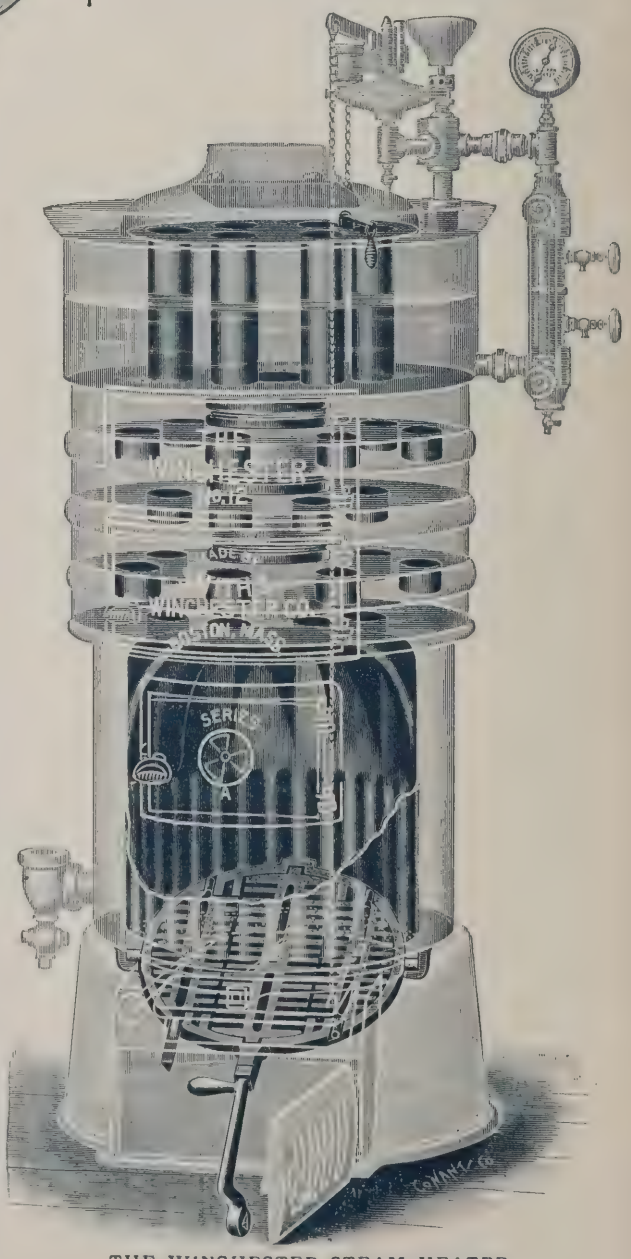
This trap is intended to remove the water of condensation from steam coils, radiators, etc., and may be placed in either a vertical or horizontal position. It is shown in the cut as ready to be placed in position on the exhaust or discharge pipe *A*. The inlet tube *D* and the outlet tube *E* have right and left threads, so as to screw into the condensing reservoir *F* and the tees on the discharge pipe. The passages in the inlet and outlet tubes are much contracted, though of sufficient size to take up the water as fast as it is condensed. The inventor states that, after blowing out the water of condensation by opening the valve *C*, and then closing the latter, the device will effectually trap the steam and carry off the water of condensation When the initial condensation is over, the valve is closed and the inventor claims that the regular condensation consequent upon the working of the device will be taken care of by the reduced passages which will pass the water but withhold the steam. We fail to understand, however, how an aperture of any given area, under a constant steam pressure, will discharge a varying quantity of water and at the same time efficiently trap the steam. Mr. Charles H. Dale, 16 Warren street, New York, is the general agent, Mr. E. L. Perry of Paterson, N. J, being the inventor.



LA FAVORITE STEAM TRAP.

WINCHESTER STEAM HEATER.

The accompanying cut shows a new steam heater just brought out by Smith & Winchester, 19 Wendell street, Boston. The special features which are embodied in the construction of the new heater are so clearly shown by the cut as to make a detailed description unnecessary.



THE WINCHESTER STEAM HEATER.

The Perry Stove Co. are now nicely settled at 242 Water street.

Fire destroyed the foundry and machine shop of the Davis-Creswell Mfg. Co., Denver, Col., on May 28th.

G. W. Dodson, Lawrence, Mass., represents the Richmond steam and hot water heaters in that vicinity. Send for catalogue.

The American Injector Co., of Detroit, have issued a new pamphlet on injectors which they will gladly send free to our readers.

T. H. Gerrells, formerly with the American Boiler Co., Kansas City, has associated himself with the Modern Heating Co. of St. Louis.

Copenhagen, Denmark, is the latest conquest of the Exeter Radiators, the Exeter Machine Works having received a large order from there.

Gorton & Lidgerwood Co., 96 Liberty street, New York city, are still in it with the Gorton boiler and report a first class spring business.

We always like to see the postal traveller of the U. S. Heater Co. of Detroit. It's unique, and that's the way to keep people interested in your business.

We note with satisfaction that the Armstrong pipe threading and cutting-off machines, with their latest improvements, are being well received by the trade.

The Herendeen Mfg. Co. have had to issue another edition of "their faultless Furman" catalogue. Everybody wanted one. You get it free. Mention H. & V.

The Hart Mfg. Co. of Cleveland, O., are now represented in the East by A. J. Huston, their travelling salesman, who is showing new improvements in their duplex die stock, etc.

P. J. Moran of Salt Lake City, Utah, has been awarded the contract for the steam heating apparatus for the new building now being erected in that city by the Rocky Mountain Bell Telephone Co.

Mr. J. W. Fowler has entered the service of the Herendeen Mfg. Co., being attached to the New York office. Mr. Fowler will give most of his attention to showing the architects the value of the company's specialties.

C. B. Jackman & Son, 24 Cross street, Nashua, N. H., want all men to know that they handle the Richmond heaters, and say so in a new catalogue in which are illustrated many nice houses where they have put them in.

Swinton, Van Etten & Co. of Port Jervis, N. J., have taken the agency for the Richmond Stove Co.'s specialties and have lately placed two sectionals in Honesdale, Pa., and another in a Central Valley (N. Y.) residence.

Buffalo is to have a new and elaborate place of music, similar to Koster & Bial's, New York. The Buffalo Forge Co. is to heat and ventilate it with their system. The contract calls for 50,000 cubic feet of pure air per minute for the auditorium.

The New Biddeford Hotel, Biddeford, Me., is using a car load of Exeter radiators put in by Wm. E. Paul of Portsmouth, N. H. Exeters are also going into the Portsmouth (N. H.) Athletic Club and the Commercial Club of Brockton.

Carton Furnace Co. have sent us a list of users of their furnaces in Detroit where there are over 2,000 of them. They say they are proud of it. We say they ought to be. Stearns Bros., 369 Woodward avenue, are the hustlers who did it.

The Peninsular Stove Co. of Detroit send us their new trade mark stickers for this season. They are issued in two sizes and various colors, and they stick all right; we can't get ours open yet. If you want a lot of them why just mention H. & V.

A new heating and plumbing company is that of Smith & Abbott, Portland, Me. It is the consolidation of the business of Smith & Abbott and Frank L. Cram. C. W. Summer is president, Wm. H. Goodwin, treasurer. Directors, Wm. H. Goodwin, L. W. Summer, S. T. Seavey.

The little book sent us by the Pond & Hasey Co., Minneapolis, Minn., is illustrated with elaborate half tone cuts showing the different dwellings they have heated. This book is one which reflects great credit on the publishers, who make a specialty of handling the "Richmond" goods.

Charles Wilder of Peterboro, N. H., has been manufacturing thermometers since 1860, and calls attention to his great variety of patterns and the unequalled excellence of his instruments. His thermometers are sold by the largest dealers, and have given the best of results. Circulars will be sent on application.

Referring to the increasing business of the S. Wilks Mfg. Co., Chicago, in the house heating line, it is pleasant to note that it is almost double that of last year, and orders are coming in from points further away than ever before. Richmond, Va., is one of the latest, and E. H. S. says it's only a beginning.

Lundell Motors and Dynamos (slow speed direct current), disk fan outfits, ceiling fan outfits, and exhaust fan outfits are manufactured by the Interior Conduit and Insulation Co. of 44 Broad street, New York city. They have just issued a new catalogue with full information. It will be sent free to readers of this paper.

The Hartford Hot Water Heater Co. has been incorporated and offices opened at 267 Main street, Hartford, Conn. F. J. Johnson, of Hartford, and A. E. Cunningham, lately of Denver, are the managers. They will push the Hartford hot water heater and will at once place on the market a new heater called the Little Gem for small work.

The Chicago offices of Henry R. Worthington have removed from 95 Lake street to 185, 187, and 189 Van Buren street. The general office of the company has been removed from Liberty street, New York, to the Hydraulic Works, Brooklyn. Mr. John R. Drew, well known among the fitters, will still have his headquarters at the New York office.

E. J. Kelley of Peabody, Mass., H. K. Austin of Reading, Mass., C. M. Briggs of Athol, Mass., James Donovan of Middletown, Conn., and Barker Bros. of Newport, R. I., have all issued catalogues giving a description of the Richmond steam and hot water goods, with testimonials from many users. They will be glad to send a copy to all in their vicinity who are interested.

Stevens, McGrath & Gilchrist. of Wilkesbarre, Pa., have refitted their store and make a fine showing with their new plate glass windows. On the floor they show a beautiful line of bath tubs and a line of Richmond heaters, for which they have lately taken the agency. Mr. Stevens was an instructor in the New York trade schools last year, and is well known in plumbing and heating circles.

The Indian schools at the Standing Rock Agency N. D., are in luck. Four Wilks heaters have gone there, and it is understood the U. S. Government is to adopt them in all its schools, hospitals, etc. The Wilks Company reports sales of heaters for residence work and hospitals in Chicago, in Kentucky, and in Ohio, and says that business is showing a satisfactory increase.

The address of Mr. W. L. Klein, delivered before the National Association of Commissioners and Inspectors of Buildings at Boston, in which he unmercifully scores the "Smead-rattan system," is attracting much attention. We have not the space in this issue to give an abstract of it, but will do so later. In the mean time copies can be obtained of W. L. Klein, Minneapolis, Minn., for 10 cents each.

Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until June 30th for a low pressure return steam heating and ventilating apparatus for the United States court house and post office at Tallahassee, Fla.; until July 6th for the U. S. post office building at Fort Dodge, Iowa, where drawings and specifications may be obtained from the superintendent of buildings; and until July 3d for the U. S. post office building at Lowell, Mass.; drawings and specifications of superintendent of building, and in all cases from the Supervising Architect, Washington, D. C.

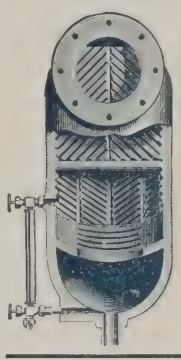
WANTED.

Announcements in this department will be inserted at the uniform rate of twenty-five cents per line. For five or more insertions of the same advertisement we make a discount of 10 per cent. Calculate on nine words to a line.

SITUATION WANTED.—By a young man having 10 years' practical experience in the installation of hot water and steam heating apparatus. Capable of estimating upon and laying out work. Good salesman and thoroughly competent of taking charge of men and superintending work. Well known in New York City and the East. Address, J. M., care of HEATING AND VENTILATION.

TO MANUFACTURERS.—I desire a position with a good company either to assist or to take charge of a hot water and steam heating department. Have had 12 years' practical experience in the hot water and steam heating business. Having considerable experience in the designing, building, testing and marketing cast iron, sectional hot water and steam boilers. Well known to the trade and architects. Address, Boiler, caer of HEATING AND VENTILATION.

THE AUSTIN OIL AND WATER SEPARATOR



(PATENTED)

FOR

PURIFYING EXHAUST AND ELIMINATING CONDENSATION

FROM LIVE STEAM

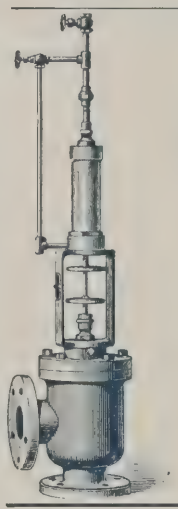
IS INFINITELY SUPERIOR TO ALL OTHERS.



Guaranteed to separate oil from the exhaust of any type of engine. Sent to responsible parties on trial. Sold strictly on its merits. Circulars and prices on application.

AUSTIN SEPARATOR CO.

59 Woodbridge Street. West. DETROIT, MICH.



THE FISHER

PATENT

Steam Pump Governors,

For Steam Pumps Working under Pressure, and the

Fisher Patent Gravity Governors,

For Steam Pumps Filling Elevated Open Tanks, are the most Positive and Durable Devices Made for the Purpose.

REDUCING VALVES AND TAPPING MACHINES.

SEND FOR CIRCULARS.

FISHER GOVERNOR CO., MARSHALLTOWN, IOWA.

"CHICAGO"

QUICK-OPENING

Hot Water Union Radiator VALVE.

The accompanying cut represents our new Hot Water Radiator Valve, which we call the **"CHICAGO."**

An examination of it will convince the practical steamfitter that this is THE valve for hot water. It has all the merits of self-packing, so the stuffing box can be packed at any time without shutting off the water. The body is heavy, symmetrical and of the best steam metal, so no danger of twisting to pieces while connecting it.

The Disc is cast brass and of good weight, with by-pass that assures perfect circulation, and the style—well, the style is to valves what Apollo was to mankind—and best of all, with all its style, worth and beauty,

It can be sold at about the same price of an ordinary valve.

We Plate these in Antique Copper to correspond with the newest architectural finish, and at no extra cost above the nickel.

Write for Circulars.

ROE STEPHENS MFG. CO.

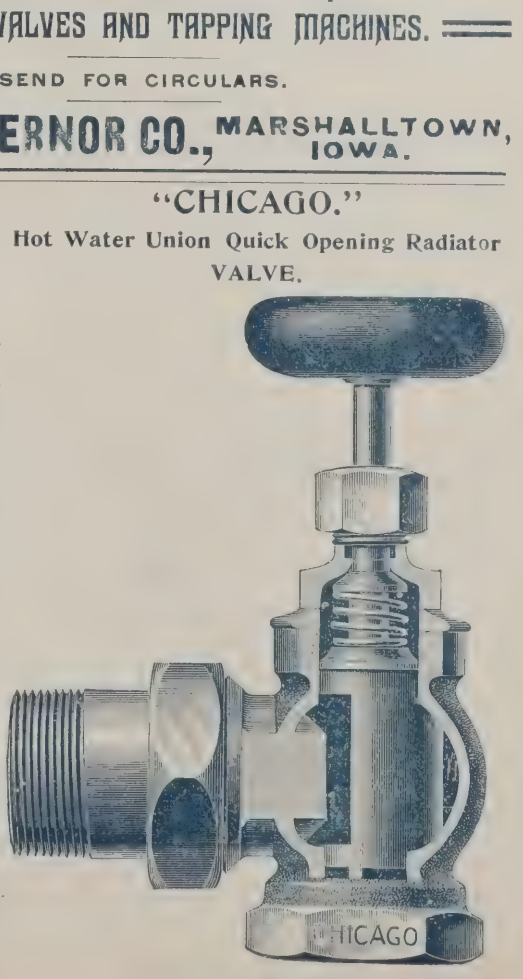
49 Jefferson Avenue, Detroit, Mich.

SCOTT VALVE CO., Western Agents,

32 N. CANAL STREET, CHICAGO, ILL.

"CHICAGO."

Hot Water Union Quick Opening Radiator VALVE.



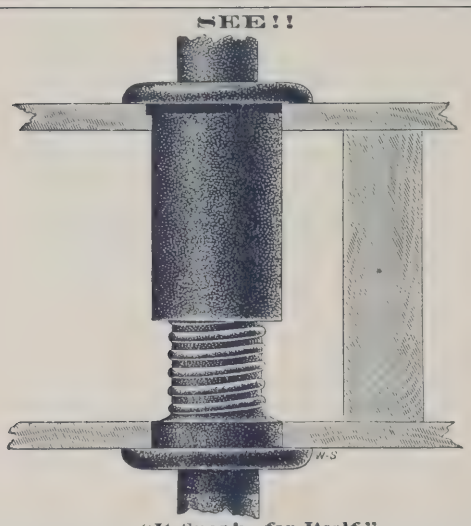


THE BENNETT HEATERS

SELDOM EQUALED.
NEVER SURPASSED.
ARE THE BEST & MOST ECONOMICAL FOR
WARMING PUBLIC BUILDINGS,
CHURCHES, SCHOOLS & PRIVATE RESIDENCES.
Estimates furnished from Architects Plans for Warming Ventilating & Dry Closets - Write for Catalogue.

THE C.H. BENNETT FURNACE CO.
289-91 Main Str. CINCINNATI, O.

SEE!!



"It Speaks for Itself."

VOSBURGH.

PATENT ADJUSTABLE FLOOR THIMBLE

AND CEILING PLATE COMBINED.

NO STEAM OR HOT WATER JOB IS COMPLETE WITHOUT IT!

REDUCED PRICES

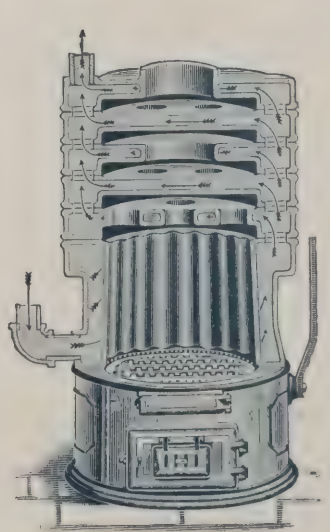
(Due to Largely Increased Sales) have made the Vosburgh Floor Thimble

MORE POPULAR THAN EVER.

Sole Manufacturers: N. O. NELSON MFG. CO., ST. LOUIS, MO.

The Ideal Hot . . .

. . . Water Heater.



HORIZONTAL SECTIONAL VIEW.

IDEAL BOILER CO.

86 DEARBORN STREET, - - - CHICAGO.

Valuable Patents For Sale.

A New line of Heating Boilers for Steam and Hot Water Work. Ten different styles for large and small work. Please examine carefully and note their good points. Read the following four pages carefully, it may be worth many dollars to you.

AN announcement of interest to Boards of Trade, Foundry Managers and Capitalists generally is made by Mr. William Vanderman, of Willimantic, Conn.

Mr. Vanderman is one of the best known of New England Heating and Sanitary Engineers, a thoroughly practical man of inventive ideas and by being the originator of many valuable inventions, his name has acquired a more than national reputation. He is not merely an experimenter and he is in no way visionary; he is a thoroughly reliable and careful business man of twenty-seven years' experience as a steam and hot water engineer and has carried on the heating and ventilating business for the past sixteen years; he is the original inventor of the use of rubber for automatic air valves. He is the manager and controlling stockholder of the Vanderman Plumbing and Heating Company, of Willimantic, Conn.



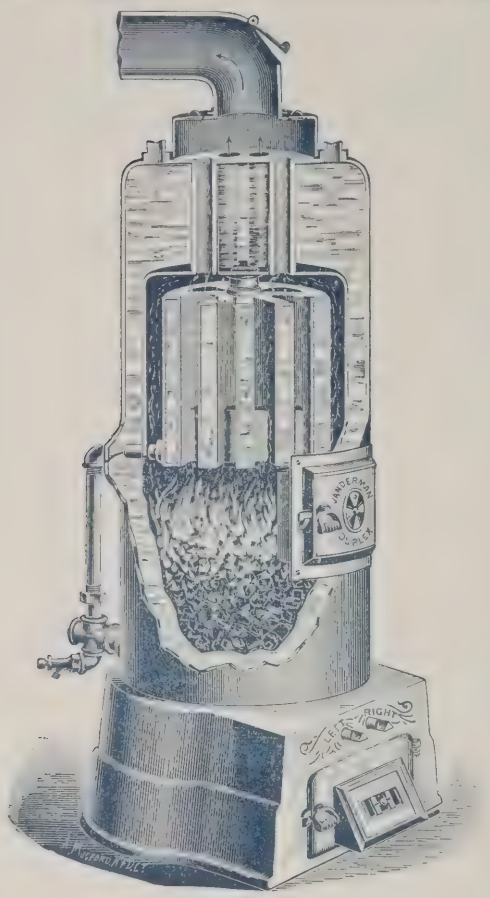
WILLIAM VANDERMAN.

Few men are as able to judge of merits, or as quickly discern imperfections in heating or sanitary apparatus; and in the line of boilers invented by him, and to which he has given the name of the "Vanderman" boilers, acme of excellence has been attained. The Vanderman patented specialties are now well and favorably known throughout the Union and in many foreign countries, and the demand for them has developed a business of such proportions as to require nearly the whole of Mr. Vanderman's attention; and in order that the latter may be given to them he has decided to dispose of his line of steam and hot water boilers and hot water damper regulator. This will afford Boards of Trade an exceptional opportunity of establishlishing a large and profitable industry in their respective cities, or to foundrymen or anybody with capital, an avenue for remunerative returns in their manufacture. Of these boilers there are five different makes equally well adapted for steam or hot water heaters. They are so constructed that they may be brick-set or covered by galvanized iron jacket, or set portable and covered or not with asbestos cement, and they are adapted to meet the demands for all sizes of boilers from the smallest to those required in the largest public buildings for either steam or hot water heating; these boilers are the equals, if not the superiors, of any line in the market. Mr. Vanderman's patented construction for connecting the different sections will allow of the boilers being put on the market at a less cost than any other manufactured. Mr. Vanderman has a peculiar economic method of construction by the use of which a large saving is made; it is a valuable feature in this or any other make of boilers, and other manufacturers could be licensed to use it. The hot water damper regulator could also be licenced to other boiler manufacturers. In every detail they are first-class and up to the times, and the large number now in use are giving unqualified satisfaction; but for the reason given he has not the time to devote to their manufacture and has therefore decided to dispose of his line of boilers to responsible parties who will manufacture them and place them on the market. He will sell all rights and patterns or will have the boilers manufactured on royalties.

This is a rare opportunity for the right people, and any who may be interested can acquire every information by addressing

WILLIAM VANDERMAN, WILLIMANTIC, CONN.

(SEE NEXT PAGE.)



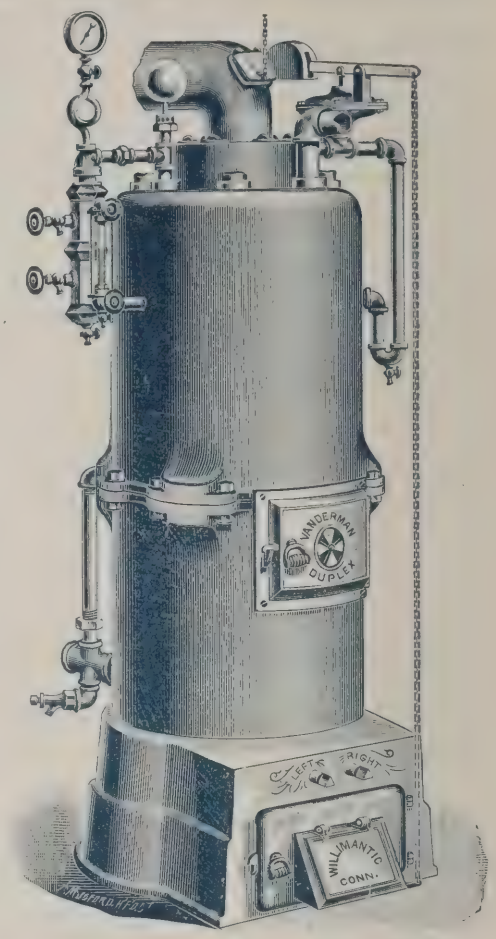
VANDERMAN DUPLEX HOT WATER HEATER.

THE VANDERMAN DUPLEX STEAM AND HOT WATER HEATERS.

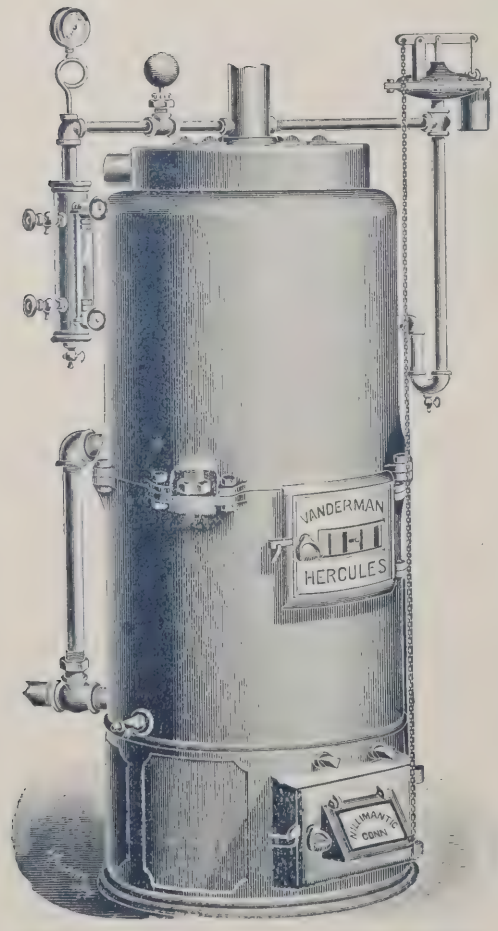
The Vanderman duplex steam and hot water heaters consist of two sections and an inner boiler; the inner boiler is screwed into the under side of the dome section, and has a connection extending from the lower side of the inner boiler to the tee on the return at the bottom of fire pot; with these connections it makes a boiler within a boiler.

Above the inner boiler and extending through the dome there are a large number of flues; the inner boiler has extending lengthwise one or more rows of triangular flues and are in line with the flues in the dome. The openings in the top of the smoke bonnet permit of ready cleaning of all the flues and the inner boiler.

The construction of this boiler is such as to bring a large amount of the heating surface where the direct rays of the heat reflect on the heating surface. The circulation is all vertical and free. The water ways connecting the top and bottom sections together, is an improved construction and requires no machinery work, as it can be put together as it comes from the foundry, and it makes a first class connection.



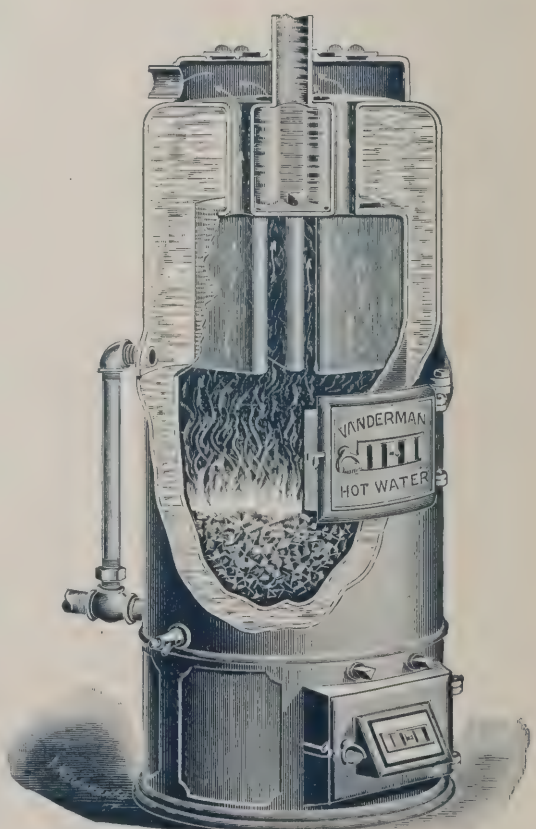
VANDERMAN DUPLEX STEAM HEATER.



VANDERMAN HERCULES STEAM HEATER.

HERCULES BOILERS.

The Vanderman Hercules steam or hot water boilers consist of two sections, which are made together by a lock-nut nipple, the upper section only being tapped out, and the sections being held together by short bolts, the joints being made tight by the lock nut being screwed down onto the packing. This makes an easily made joint and saves in the cost of the construction of the boiler. The fire surface is all directly over the fire, and consists of wings extending out from the sides of the boiler and connected to the crown sheet between the flues; a number of flues extend from the crown sheet through the dome to the smoke bonnet. All of the fire surface is easily cleaned through the smoke bonnet and fire door. The circulation is all vertical.

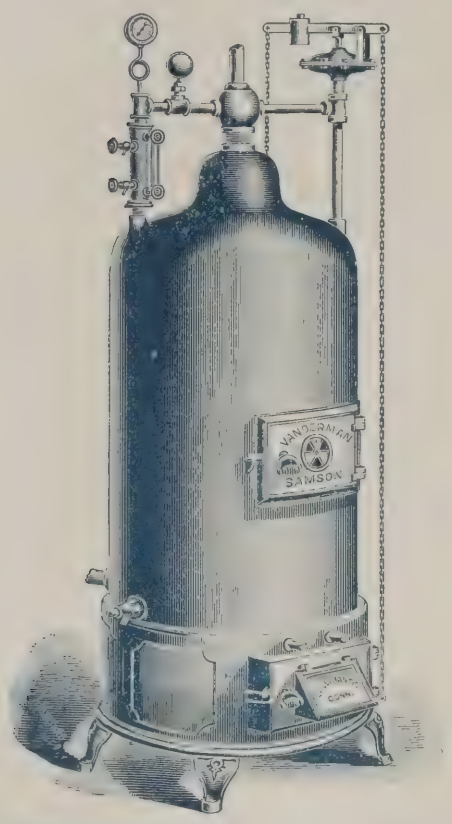


VANDERMAN HERCULES HOT WATER HEATER.

The Patents of these boilers are for sale; read the particulars on the first page.—See next page.

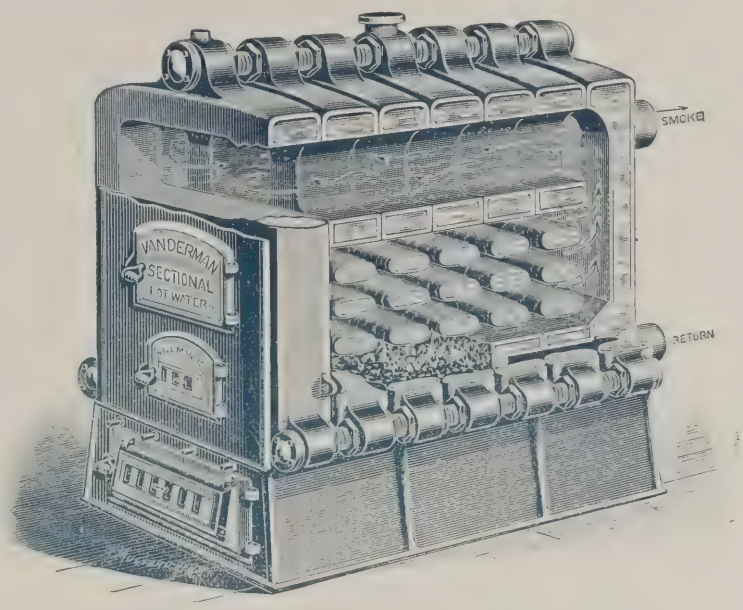
SAMSON BOILERS.

The Vanderman Sampson steam and hot water boilers are specially adapted



VANDERMAN SAMSON STEAM HEATER.

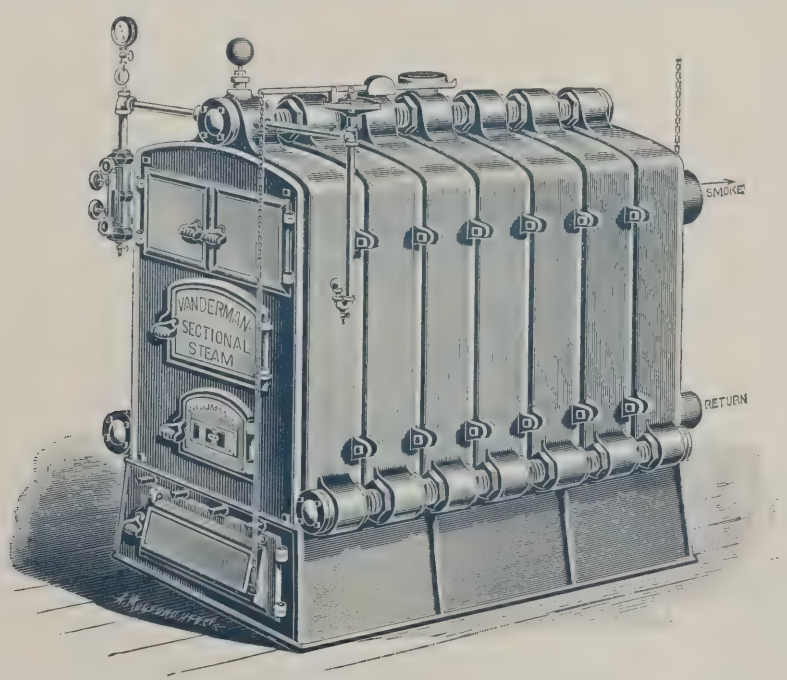
for steam and hot water heating, for the small classes of work; it is a one piece boiler and would be suitable for heating hot water for baths or laundry purposes or cottages by either steam or hot water and would make a powerful and cheaply construced boiler; it has a large fire surface directly over the fire, which consists of wings extending out from the side of boiler and an opening in the side and top of boiler which permits of a free and easy circulation; when the boiler is used for steam, the steam globe is screwed into the top of the boiler; the number and size of the wings are made in proportion to the size of the fire pot. All of the fire surface is easily cleaned from the fire door.



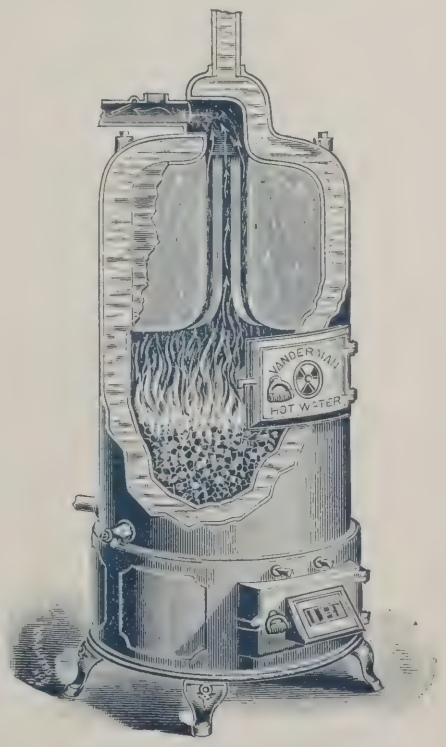
VANDERMAN SECTIONAL HOT WATER HEATER.

THE VANDERMAN SECTIONAL STEAM OR HOT WATER HEATERS.

The Vanderman sectional steam or hot water heaters are more especially adapted for the larger class of work, such as schools, churches and public buildings; it makes a powerful economical and durable heater with large and effective fire surface, and all the fire surface is so arranged as to be easily cleaned; in the construction of this heater, I claim a great advantage in the cost of construction over any other sectional heater in the market, as I can put the connections together as they come from the foundry without any machine labor with my patented construction for making up the sections and also doing away with the three connecting drums that are required on other makes of sectional boilers. The heating surface in this boiler is so arranged as to require the heated gases to pass the length of the boiler three times.



VANDERMAN SECTIONAL STEAM HEATER.

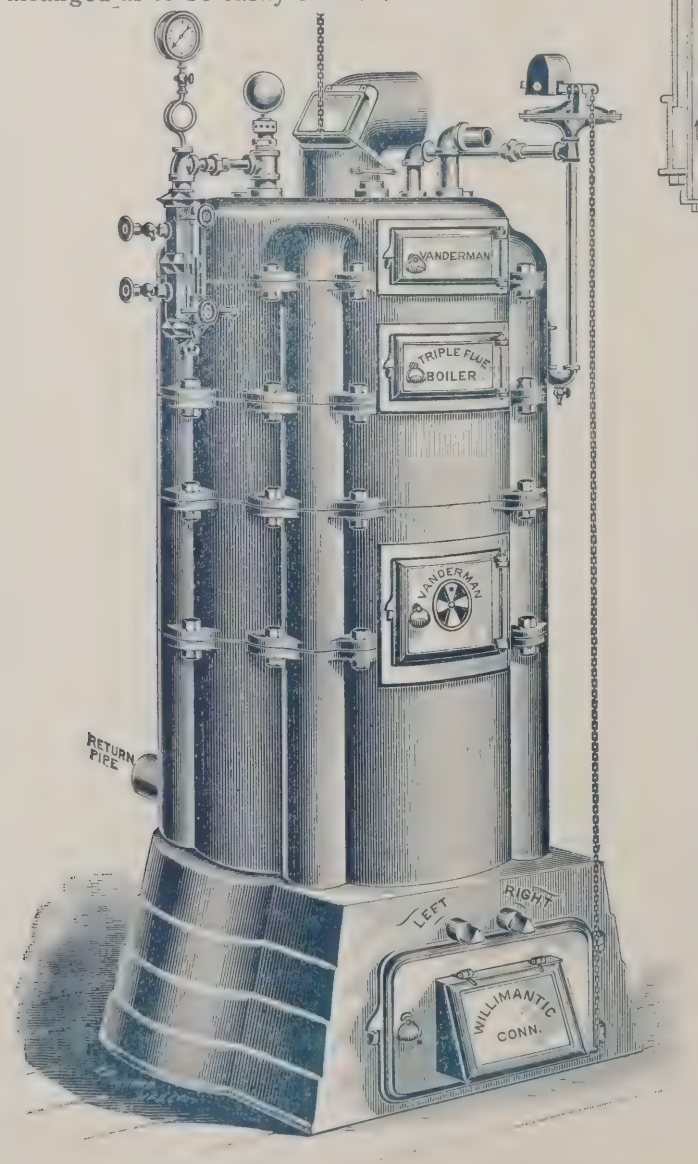


VANDERMAN SAMSON HOT WATER HEATER.

The Patents of these boilers are for sale. Read the particulars on the first page.—See next page.

THE VANDERMAN TRIPLE FLUE BOILERS.

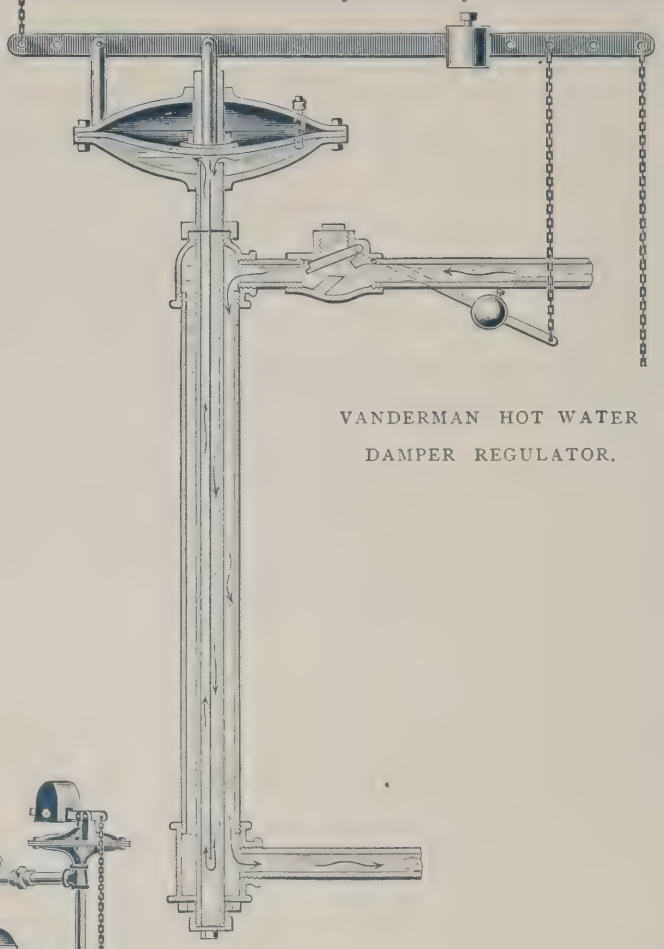
The Vanderman triple flue steam and hot water heaters are made up from a number of sections with a number of large water ways extending from the fire pot section to the dome section, which permits of a free circulation. The connecting water ways are made with an improved connection requiring no machine labor, and yet it is strong and an everlasting connection. It has a large crown sheet fire surface, and the heated gases after striking the crown sheet pass to the dome section through a row of flues which are located at the outer edge of the fire pot and extend to the dome, an inner row of flues extend from the dome to the upper side of fire pot section, and from the fire pot section a large central flue extends to the smoke outlet; by this arrangement the heated gases pass the length of the boiler three times. It has a large amount of heating surface, and has a direct and indirect draft, and all the fire surface is so arranged as to be easily cleaned.



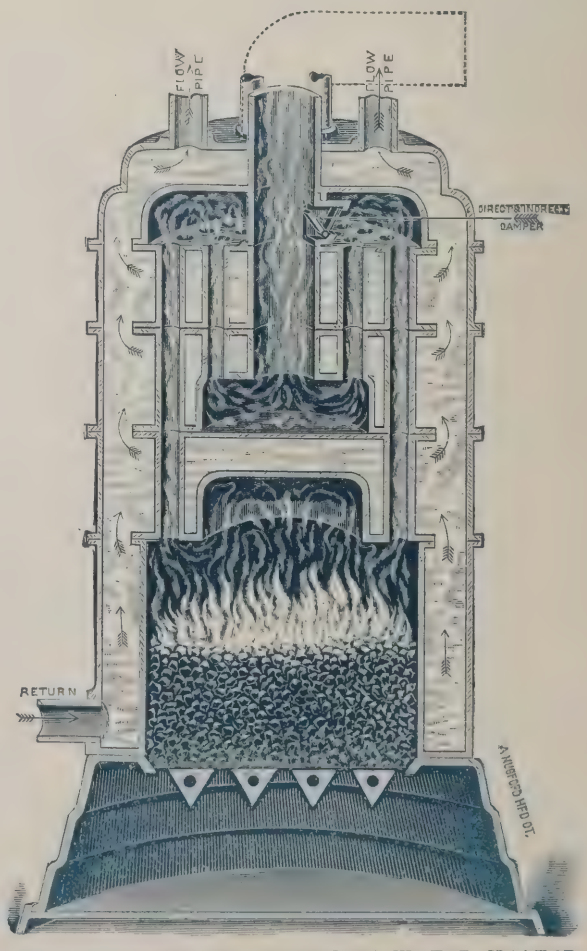
VANDERMAN TRIPLE FLUE STEAM HEATER.

VANDERMAN HOT WATER DAMPER REGULATOR.

The Vanderman hot water damper regulator is very simple in construction and is adapted to any make of hot water boilers and its operation depends on the expansion of water or other liquids; it consists of an outer cylinder which has a connection at its upper and lower ends, with the boiler or flow and return pipes, by which connections the water circulates around the inner pipe. The pipe which connects with the damper regulator chamber has a disc or partition which makes a positive circulation to the damper regulator chamber. On the flow pipe connection there is placed a swing check valve which is made adjustable by moving of the chain attachment, and by this movement the operation of the regulator can be made to close the draft and open the check damper as desired. The damper regulator chamber is so arranged as to permit of it being filled or emptied after it is placed in position by means of screw caps placed at top and bottom.



VANDERMAN HOT WATER DAMPER REGULATOR.



VANDERMAN TRIPLE FLUE HOT WATER HEATER.

The Patents of these boiler are for sale; read the particulars on the first page.—See the three preceding pages.

LETTERS FROM PRACTICAL MEN.

Correspondence from practical men upon topics of interest relating to Heating, Ventilating, and kindred subjects, will find a place in this department. The editors, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

Mills' Overhead System of Heating.

I have been reading with interest the papers published recently by you from the pen of Mr. James R. Willett on the Heating and Ventilation of Residences, and have noted in particular his description of what might be called an overhead water circulation. In a previous number there was one point which to my mind might have been open to criticism in his treatment, not so much of the system itself as of its originator. Mr. Willett says, "This system is sometimes called the Mills' system, from the writer who described it."

While anyone who knows Mr. Mills will at once appreciate the fact that he is undoubtedly able to defend himself on all points, yet I think it his due, in consideration of the unquestionable benefit he has been to the public at large in his researches in the direction of heating and ventilation, that some one in the trade be ready to champion his cause, and see that his services receive all their just recognition.

Mr. Willett may have used the expression carelessly and without further motive, but at the same time, to one who is acquainted with Mr. Mills and his work, the fact of his being mentioned simply as a writer who described such an idea, cannot fail to be repugnant. As a suggestion to Mr. Willett, it would be well if he remodel the paragraph and insert, "Sometimes called the Mills system, from the inventor who originated, patented, and put it into practice." (No. of patent, 145,962, of Dec. 30, 1873, with a reissue, No. 6,591, of Aug. 10, 1875.)

FAIR PLAY.

A Ventilating Problem.

From a study of "Contract Open's" problem in the May issue, it is at once evident that all the data necessary to intelligently answer the question is not given to the readers. However, by assuming, rightly or wrongly, certain facts and conditions as probably existent in the "tall office building," one or two methods of curing the trouble suggest themselves.

The statement is made that in the southern end of the cellar and sub-cellar the temperature runs up to 118 degrees in summer, and this at once locates the seat of disturbance (not vouchsafed in the problem) as necessarily in the boiler and engine room below the sidewalk level, otherwise the "tall office building" would be begging for tenants.

The number of boilers indicates that a large quantity of coal is burned, and their distance from one another, as well as the distance of each from the flue, leaves little room for doubt that the smoke connection (presumably of iron), being excessively long, must give off (even though covered) a great amount of heat into the room or rooms through which it passes, which, under proper conditions, should not be there.

It must be further assumed that "Contract Open" has seen to it that every foot of radiating surface of whatever description is properly covered to prevent an aggravation of the "bad ventilation" due to the surplus of heat coming probably from such sources.

"*Small* ventilating flues" are mentioned, but again one must assume these to be *so* small as to have proven useless, although fans in every one will materially diminish the trouble.

The problem resolves itself, then, into this. That there is in the basement and sub-basement of this "tall office building" an abnormal radiation of heat from sources of such a character that this radiation is presumably unpreventable, leaving no alternative but to remove it. To do this, either sufficient vents must be provided to enable the natural laws governing heated gases to free the cellars of their surplus heat, or else mechanical means of exhausting this heat (by driving or sucking it through such vents as do exist) must be supplied. The first method must be thrown out as impracticable, for otherwise resort to it would already have been taken.

The only natural vent of sufficient size to waste this heat which suggests itself as feasible for the purpose is the well generally built in tall office buildings for the steam or hydraulic elevator piping. By locating fans of large capacity at the foot or top of this well, and by properly disposing the exhaust ducts leading to the foot of the well, certainly the greater part of the abnormal heat should be quite readily vented to the top of the building. One obstacle alone apparently stands in the way of this solution; a knowledge of boiler plants, such as the one under discussion, gives warning that large quantities of dust (continually accumulating from the furnaces) will be sucked or carried into the well only to cause serious trouble to the contained machinery.

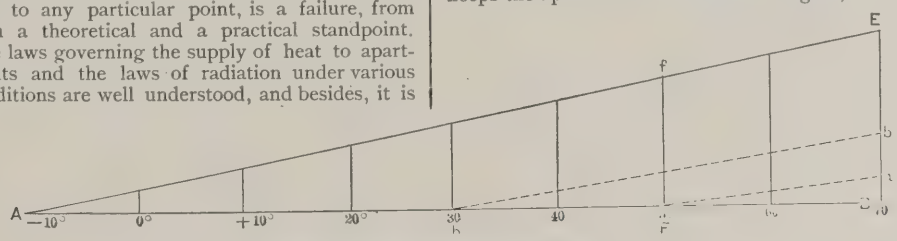
How may this dust be arrested? I have several ideas, but prefer to hear from somebody else. Who knows of or can devise a dust arrester?

J. G. DUDLEY.

Temperature Regulation.

The April issue of your periodical contains an editorial paragraph on the thermostatic control of temperature in which you suggested that a thermostat which would operate a damper gradually instead of positively would be very desirable.

A gradually closing damper or other valve for heating-appliances, in order to regulate temperature to any particular point, is a failure, from both a theoretical and a practical standpoint. The laws governing the supply of heat to apartments and the laws of radiation under various conditions are well understood, and besides, it is well known that the amount of heat required to keep an apartment at an exact degree increases as the variation increases between the desired temperature and the external temperature; or, taking any fixed temperature as a basis, the amount of heat required to heat an apartment is greater and greater as the internal temperature becomes higher, the difference increasing in a combination of arithmetical and geometrical ratios. Absolute zero, or —459 degrees F., is the basis on which the calculations are made. This may be graphically illustrated by the accompanying diagram.



TEMPERATURE REGULATION.

In this diagram I have supposed the external temperature at its lowest point to be 10 degrees below zero. A horizontal line indicates variations of external temperature up to 70 degrees, and 70 degrees is also supposed to be the desired temperature of the apartment. The line *B E* represents the amount of heat that is required to keep the apartment at 70 degrees when the external temperature is 10 degrees below zero. The vertical lines represent the amount of heat required at any intermediate point. For instance, the line *F f* represents the amount of heat that will be required to keep the apartment at a temperature of 50 degrees when the external temperature is 10 degrees below zero. Instead of taking 10 degrees below zero as a basis of external temperature let us take 50 degrees above as the external temperature and draw the line *F a* to represent the increase of heat required to raise the apartment to 70 degrees. In like manner the line *b b* represents the increase of heat required to raise the apartment to 70 degrees with the external temperature at 30 degrees. By comparison of the lines *B a*, *B b*, and *B E* the amount of heat required to keep the apartment at 70 degrees, with the external temperature at 10, 30, and 50 degrees respectively, is seen.

A properly constructed heating appliance will furnish to the room a sufficient amount of heated air to keep the room at 70 degrees when the external temperature is at the lowest point. Let us suppose that the line *B E* shows the opening of the flue into the room, furnishing air at a certain temperature and a certain velocity. It will be seen that this opening would be just sufficient to keep the room at 70 degrees when the external temperature is 10 degrees. If the apartment is to be raised to a less temperature as 60, 50, 40 degrees, etc., a less opening would be required, represented on the diagram by the vertical lines opposite these degrees. From this it will be seen that as the temperature in the room departs from the external temperature the opening into the room must become larger.

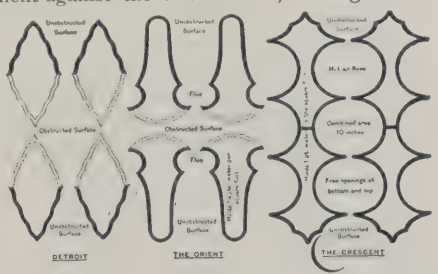
Let us suppose that a thermostat be applied to the damper in this flue, and is to close it gradually. Let us suppose that the thermostat begins to operate it at 60 degrees and gradually closes the flue until it is fully closed at 70 degrees. It will be seen that between 60 and 70 degrees we are making the flue *smaller* instead of larger, or in other words, exactly *contrary* to the requirements. If the flue when fully open is only sufficiently large to heat the room to 70 degrees when the external temperature is at the lowest point, it is plainly to be seen that if we should begin to close it at 60 degrees it would never reach 70 degrees at all, because it would reach a point where the restricted flue would allow only sufficient air to pass to keep the room at that intermediate temperature. On the other hand, should we leave the flue fully open at 70 degrees (as would be required in the coldest weather) when the weather was warmer, say 30 or 50 degrees, it would be fully open at 70 degrees when it needed to be open only the amount *B b* or *B a*. It follows that instead of regulating the apartment to 70 degrees the temperature would go much higher. To keep the apartment at 70 degrees during all the changes in the outside temperature, there would need to be daily adjustments of the thermostat, which is entirely impracticable, and the device would be of little use. A perfect heat regulator is entirely automatic, and keeps the apartment at the desired degree, whatever the external temperature. In order to do this the valve must remain fully open up to the *degree required*, and to prevent overheating in moderate weather must close *entirely* and *positively* at that degree. All other methods will be found ineffective and of little utility.

WARREN S. JOHNSON.

The Flue Versus the Loop.

In the April issue there appears what purports to be an answer to an article in the February issue on the above subject, but a careful perusal of it fails to reveal that respect to which "an honest difference of opinion is always entitled."

As showing the greater value which manufacturers attach to the loop radiator, and as an argument against the flue radiator, "Knight" compares the price of the Detroit flue radiator, 20 inches high, 12 inches wide, 5½ or 6 feet of surface, and listed at 23 cents, with the price of a loop radiator of the same height, having 2 feet of surface and listed at from 28 to 30 cents per foot.



The above argument loses all its force in view of the fact that flue radiators are manufactured at a materially less cost than loop radiators, so that the price of flue radiators is actually from one to three cents higher than that of standard loop radiators having the same amount of surface. The price of the flue surface does not, therefore, correspond to the "one-third loss in efficiency due to the flue construction," as "Knight" tries to make us believe. It is evident that the above prices have no bearing whatever on the relative merits of the constructions under consideration.

The accompanying cross sectional cut represents three well-known but widely different types of radiators, showing their actual relative proportions and the relation which one section sustains to the other. No superiority is claimed for either style of section so far as exterior or unobstructed surface is concerned. With that portion of the loop designated by dotted lines, however, there is a marked difference.

The efficiency of this portion of the section is absolutely dependent upon free air circulation to carry forward and distribute the heat. One surface radiates its heat upon the other, and the nature of the construction offers no adequate escape for the heat thus evolved.

The flue, with its free openings at the bottom and top and its powerful drafts of heated air, is especially designed to obviate these defects. I therefore claim that while the interior or obstructed portion of a loop radiator is the weakest and most ineffective part of the section, precisely the reverse is true of the flue. Also that the efficiency of the flue is greatly enhanced in extremely cold weather, insuring a quick circulation of air through the flues, which cannot be said of the loop, simply because the conditions differ so widely. What the proportions of radiant and convected are in each is a matter of indifference. X.

BUSINESS NOTES.

The Magee Furnace Co. of Boston will send free to the readers of HEATING AND VENTILATION a sample of the great "Columbus Egg Puzzle," the trick of which is to make the egg stand upright. Send for one and have lots of fun.

The Raymond and Campbell Mfg. Co. of Middletown, Pa., send us one of their latest catalogues, which we have heretofore mentioned in this journal, but new prices to supersede all others are now in force, and if you haven't received them send for one at once.

Heating apparatus for steam, hot water, and combination comes to us from Giblin & Co., Utica, N. Y., in the shape of a new, well-printed catalogue, showing all their new lines. Have you seen their improved design Standard for hot water? If not, get it quick.

The Wm. H. Page Boiler Co., of Norwich, Conn., advise us that the management of their business in New York city has been placed in the hands of DuBois & Darrow, 61–63 Gold street. Correspondence and orders should be sent to them, and will receive prompt attention.

The Thayer Heater Co. of 143 High street, Boston, has received the order for heating the Sibley Memorial hospital, Washington, D. C. A No. 27 water pop heater will be used. The company has also contracted for a No. 22 heater in Washington, D. C., and is to place its system in Chelsea, Mass., Hull, Mass., Milton, Mass., Hingham, Mass., and two in Roxbury, Mass.

The Smead system has probably been dropped for good in Buffalo. We can all give thanks for this, as the company were not up to date in any of their school work. All experts on ventilation agree that mechanical means must be resorted to in any kind of a school of over four rooms. Buffalo is particularly fortunate in having at its command the products of the Buffalo Forge Co., who have made a specialty of mechanical ventilation, and are leaders in this line. We understand that hereafter all the schools in Buffalo will be equipped with their system.

Geo. H. Bell & Co., sole agents of the Peerless boiler, at 114–116 Nassau street, New York, say they are behind their orders at the factory. This heater is simple and cheap.

The Powers Duplex Regulator Co. are having great success in the introduction of their system as applied to school work, where an absolutely even temperature is most necessary. At the First Ward School in Long Island City the results are most satisfactory, and arrangements are now being made to equip many other buildings.

The Carton Furnace Co. of Utica, N. Y., are about commencing additions to their plant to prepare for the manufacture of their new line of "Carton" steam and hot water boilers. Together with the necessary machinery they will put up a new core oven, and a new building 45 by 75 feet for storage, fitting, and shop room. They will also add to their foundry floors. Their first series of boilers both for steam and hot water will be ready for the market by the middle of August. The company have already made several contracts in which their boilers will be used.

The Peninsular Stove Company of Detroit, Mich., want to send you one of their new memorandum books, which is made up in several different colors, has a yearly calendar, an identification page, the population of the United States, the weather signals, rates of postage, money orders, etc. It also has abbreviated rules and usages of parliamentary tactics, a page of interesting facts, a page on helps in case of accidents, and a page on antidotes for poisons. The yearly calendar is for 1895 also. Besides all this you have an ample memorandum book. It will be sent free by mentioning H. & V.

The new "Winchester" steam and hot water boilers, of which the first four sizes, 16, 18, 21 and 24, will be ready for the market July 1st, will be very recherche in appearance, the castings and fittings being designed to overshadow all its competitors. The fittings are nickel plated and from special designs furnished by Mr. Frost. The outlet and return is so arranged that the boiler may be set in a corner and take up but little room. Special features are perforated cast iron plate to prevent doors getting too hot and warping, new design water gauge, new deflecting shield, and several other unique and good features, notwithstanding which the boiler can be sold at a low price.

Warming, Ventilation and Sanitary Requirements, Practically Considered and Applied for Use in Schools and other Public Buildings comes to us from the Fuller & Warren Warming and Ventilating Co., of 43 Milk street, Boston. This work is one on which many hundreds of dollars have been spent, and the illustrations are of the finest possible. The work opens with quotations from distinguished men on the effects of impure air. Ventilation is carefully considered, with illustrations. The fresh air supply, how to carefully select its source follows. A practical talk about the heat generator develops many points of interest. Next, the sanitary requirements are taken up and receive careful treatment. The F. & W. methods of dry closets and flushing closets, also systems of heating by steam, and all the latest and best things in this line of work are shown. The book is profusely illustrated, showing many fine buildings in which this system is used. The articles on heating and ventilation are compiled by Mr. W. F. Wolfe, who is recognized as one of the leading engineers in this line of work. Send for catalogue, mentioning H. & V.

It is pleasant to note in these times of dullness that the Walworth Mfg. Co. of Boston are busy, running to their full capacity, and have never cut down their working hours during the depression; in fact, they sold more goods last year than they did the year before.

J. H. Cunningham & Co., 109 Milk street, Boston, who handle the Standard radiators in the east, report a most encouraging outlook. Among the many visitors to Boston last week were D. P. Hughes of the Standard Radiator Co. and Geo. E. Downe of the Ideal Boiler Co. Mr. Downe reports the establishment of a number of new agencies.

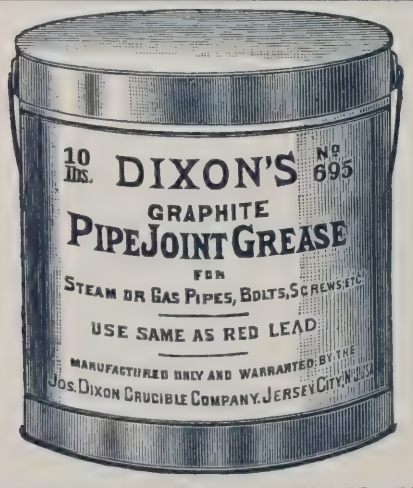
The Boston Blower Co. have lately placed two large ventilating fans in the Houston street station of the Broadway Cable Road through the Barnes Engineering Co. of New York city. They have also placed two large ventilating fans on the Cincinnati, and fans for forced draft on the Neenah, government tug, and shipped two to Norfolk for the U. S. S. Raleigh. This company have also been very successful in school work and are furnishing many fans for such use.

The Thatcher Furnace Co., of 240 Water street, New York, are fitting up their new store most tastefully. The windows are lettered in gold leaf, a line of electric lights illuminates the interior, a new line of signs are being made which will completely cover the front of the building, a brass railing will separate the private from the public part of the offices, the sides of which will be inlaid with tiling, making a very elegant effect. On the floor a sample of each of the 12 sizes of furnaces they manufacture are well arranged, and the Champion steam and hot water boilers, which they have put on the market this season will occupy prominent space. The company have just built at their works a new pattern shop, and made other necessary improvements. The company state they are really behind their orders for their steam and hot water boilers.

The A. A. Griffing Iron Co. have a hustler in their new manager, Mr. Chas. A. Lathrop, who has charge of their New England business, with offices at 177-179 Fort Hill Square. The formal opening of this branch occurred May 16 and 17th, with the 17th as ladies' evening. Between 300 and 400 callers availed themselves of the opportunity of paying their respects. An orchestra was present both evenings and on Tuesday a male quartette added much to the most excellent programme. The rooms were beautifully decorated with potted plants effectively distributed, while from a café in the rear ample lunch was served. Thos. H. Williams, president, and Samuel D. Tompkins, treasurer of the company, were present to make the welcome more binding. The fitting up of these offices has been done regardless of expense. They are carpeted most expensively, a brass railing around a raised platform in front partitions the manager's office from the general store, which has a beautiful piano lamp in the center, curtains divide the rear, which can be used for private conferences, and pictures of their works, etc., adorn the walls. Their different styles of radiators are well arranged and beautifully decorated. A case of the specialties they manufacture helps to adorn the rooms, so well are they arranged, while the specimens of bronze imported by them are very interesting. At one side a line of Littlefield steam traps, of the patent on which they are now sole owners, gives an idea of the extensive line of goods they now handle. A telephone cabinet and other necessities all make up a well appointed outfit which reflects great credit on the management.

WE ARE MANUFACTURERS OF FURNACES FOR HEATING & VENTILATING CHURCHES, SCHOOLS, STORES, DWELLINGS. WRITE US FOR PRINTED MATTER

JOHN GROSSIUS' SONS
389 MAIN ST. CINCINNATI, O.



FAR BETTER AND CHEAPER THAN RED LEAD

Makes a tighter joint than red lead, that can be opened with perfect ease many years after.

Invaluable for all steam, gas and water piping, and equally useful for smearing gaskets on flange joints of meters, traps, and for bolts, screws, etc.

JOS. DIXON CRUCIBLE CO.,
JERSEY CITY, N. J.



The Sanitas Trap.

FOR THE BATH ROOM

there is nothing equal to

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The Sanitas Bath.

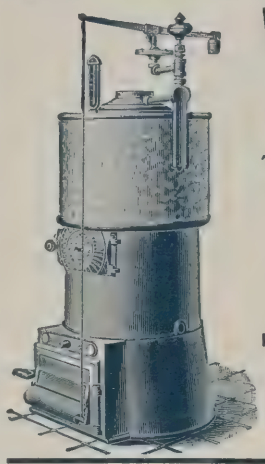
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Announcements in this department will be inserted at the uniform rate of twenty-five cents per line. For five or more insertions of the same advertisement we make a discount of 10 per cent. Calculate on nine words to a line.

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The best and ONLY Self-regulating Hot Water Heaters on the market

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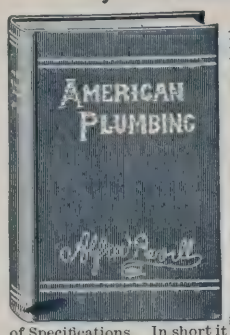
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Made in all sizes.
Send for circular and prices.
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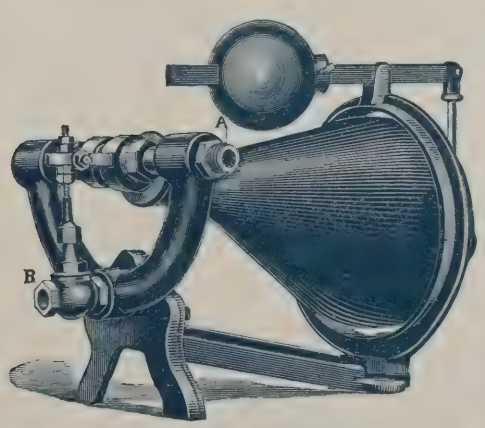
Once in place this plate always stays there! The tension of the spring keeps it!

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A Departure in Steam Traps.

One having no interior mechanism—all ports exterior and accessible—the weight of the water of condensation furnishes the valve operating power.

We have observed the operation of



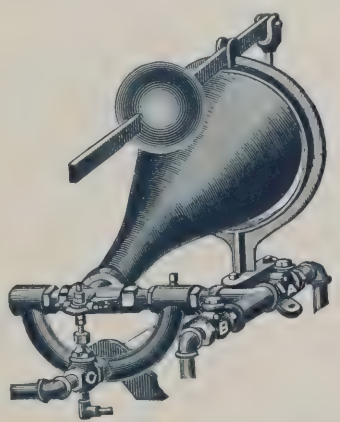
BUNDY TANK STEAM TRAP.

the steam trap here illustrated while discharging into the atmosphere, also into a tank raising the water two feet for every pound of working steam pressure used, and it worked perfectly. The weight of the waters of condensation furnish the valve operating power, for when the water has filled the pear shaped bowl it overbalances the ball weight on top and settles into the frame, thereby opening the discharge valve.

The Bundy steam traps are made under the Littlefield Patents of Sept. 29, 1891, Feb. 7, 1893, and Jan. 30, 1894, and was formerly known as the Littlefield Trap. The A. A. Griffing Iron Co., New York, have acquired these goods, and in future they will be sold exclusively by them and known as the Bundy Steam Trap.

One of their chief claims of superiority is the fact that whether the trap is operating or not is clearly visible to the eye even at a considerable distance. The bowl fills and discharges with apparent human intelligence. The fall weight is set where it will just overbalance the empty bowl.

Thousands are used at present in all parts of the world, but their special merit is of course most apparent in large mills, in drying rooms, and where the amount of water to be disposed of is the greatest. The Bundy Return Trap for feeding a power boiler in place of a pump or any other device is a great saver of steam and coal and will soon save enough to pay for its cost.



BUNDY RETURN STEAM TRAP.

A. A. Griffing Iron Co.

RADIATOR MANUFACTURERS

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We understand that E. N. S. secured specifications for two boilers in New York and 16 in Washington and Philadelphia on his latest trip, and the New York Central Iron Works Co. is consequently "right in it." We are all watching for the 20,000.

An illustrated pamphlet from Bement & Co., of 1200 Maller's Building, Chicago, giving a description of their feed pump governors and automatic feed water regulators for boiler feeding, has been received. Tests of the work of the apparatus are given. If interested, the circular will be sent free on application.

The Connersville Blower Co., Connersville, Indiana, send us their catalogue on positive pressure blowers, gas exhausters, rotary pumps, and hydraulic motors for small machines, fans, pipe organs, etc. This is the first catalogue issued by the company, who have planned shops to secure every possible convenience and economy in operation. Their equipment consists of new and improved tools of the most modern design, and are capable of executing a large amount of work with the maximum degree of accuracy. The company have built, at a great expense, a number of special machine tools by which a degree of accuracy is secured in rotary blowers heretofore unknown, and the efficiency is thus greatly increased. On the basis of superior goods, reasonable prices, and a liberal policy, they respectfully solicit a share of your patronage.

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220 Devonshire St., Boston, Mass., Dec. 27, 1893.

MESSRS. HODGE BROTHERS, Boston, Mass.

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Respectfully yours,
C. C. MITCHELL,
Boston University,
Supt. of Buildings

Pat'd Aug. 2, 1892.



External view of No. 5.

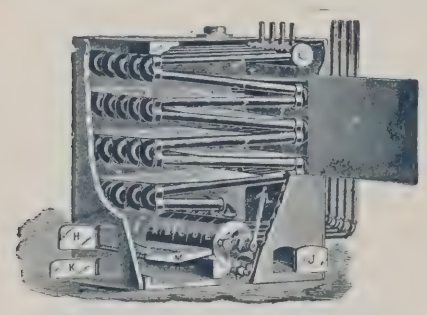
Price $1.00 Each.

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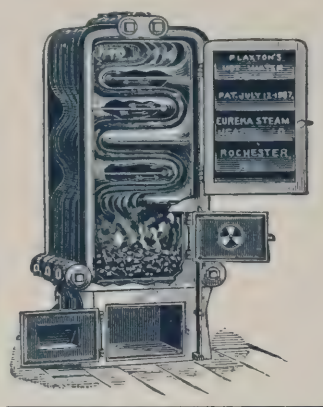
Mackay Mfg. Co., 211 Water St., N. Y. CITY.
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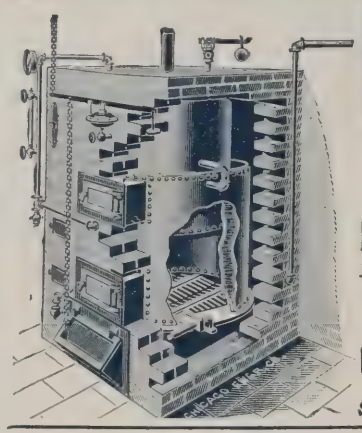
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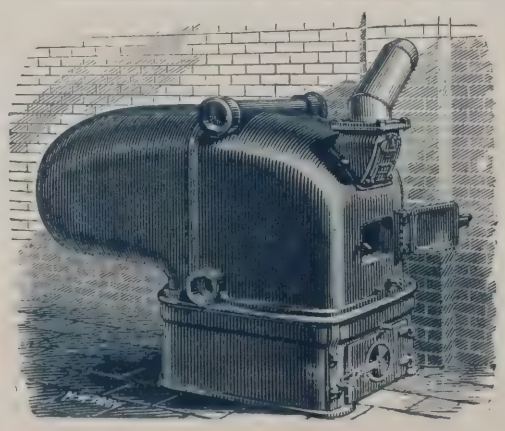
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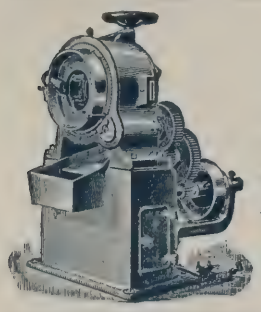
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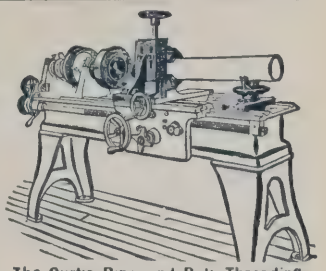
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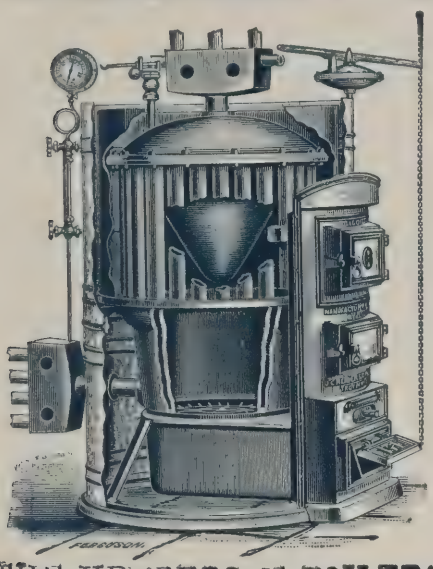
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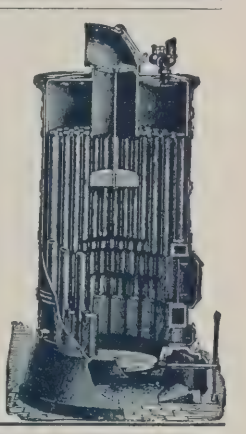
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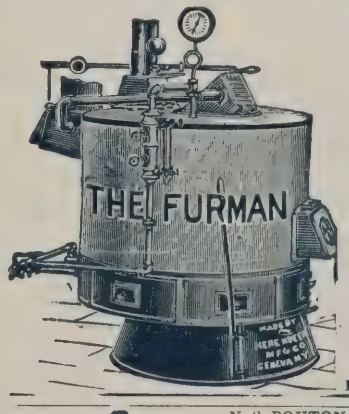
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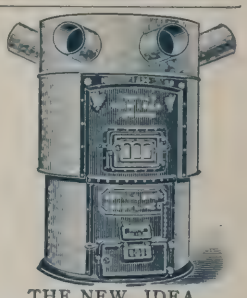
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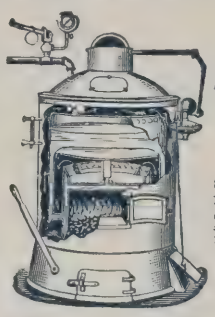
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Yours truly,
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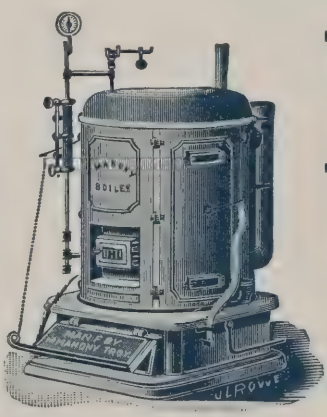
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NO EXPERIENCE NEEDED TO APPLY IT.

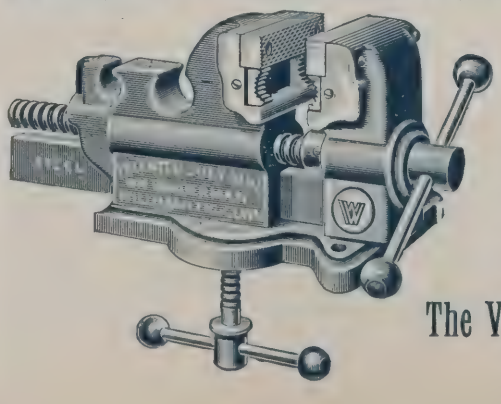
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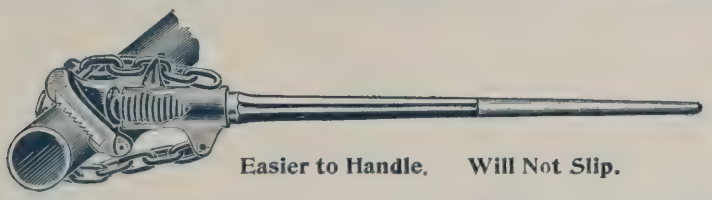
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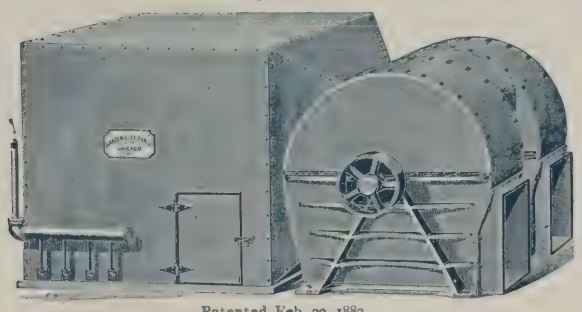
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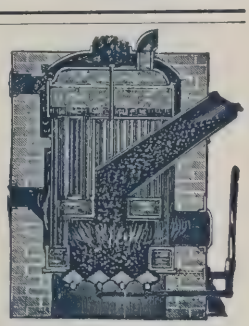
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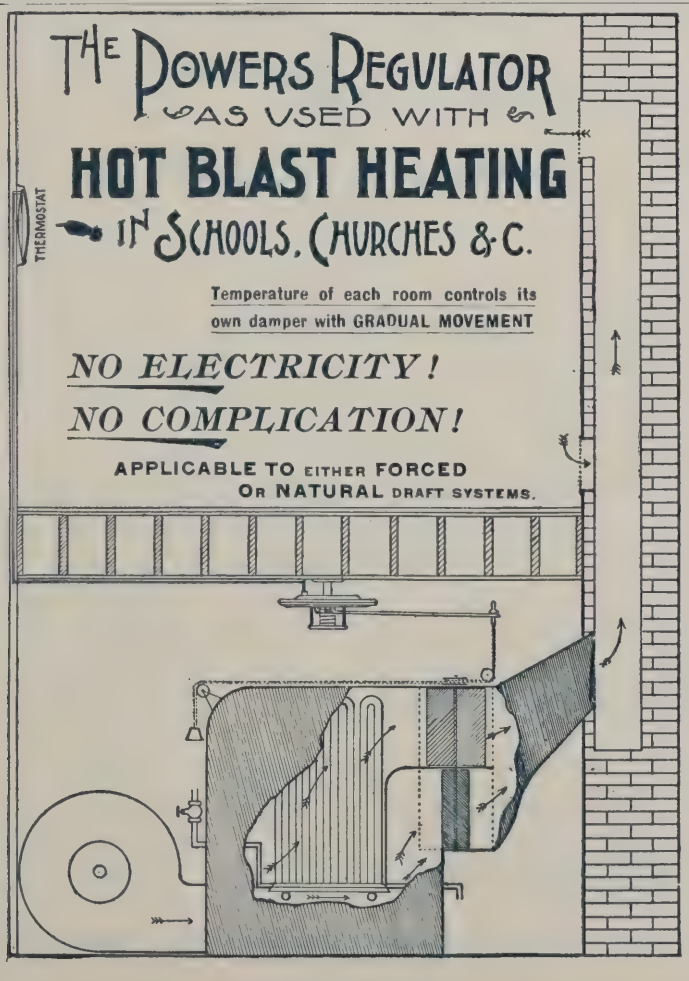


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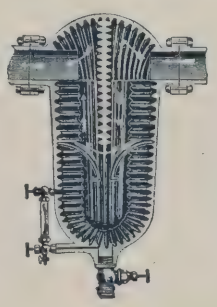
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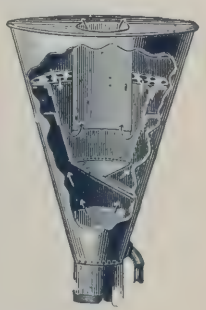
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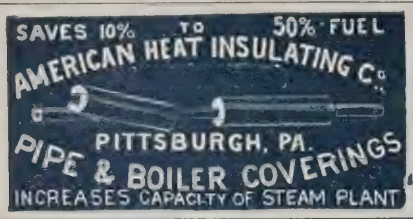
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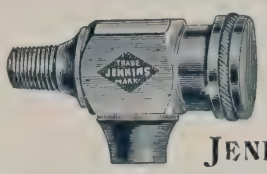
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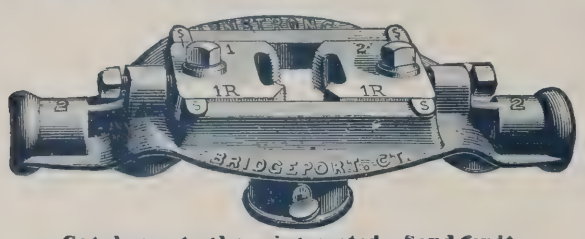
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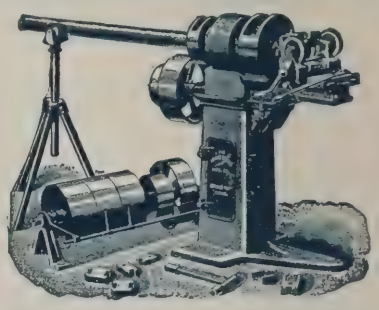
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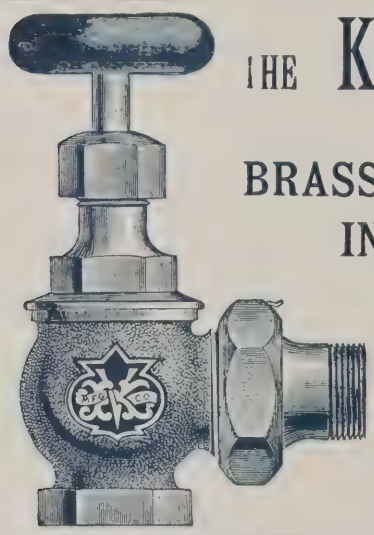
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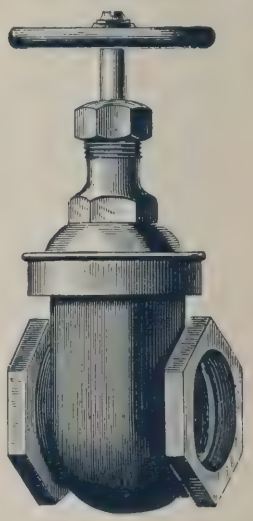
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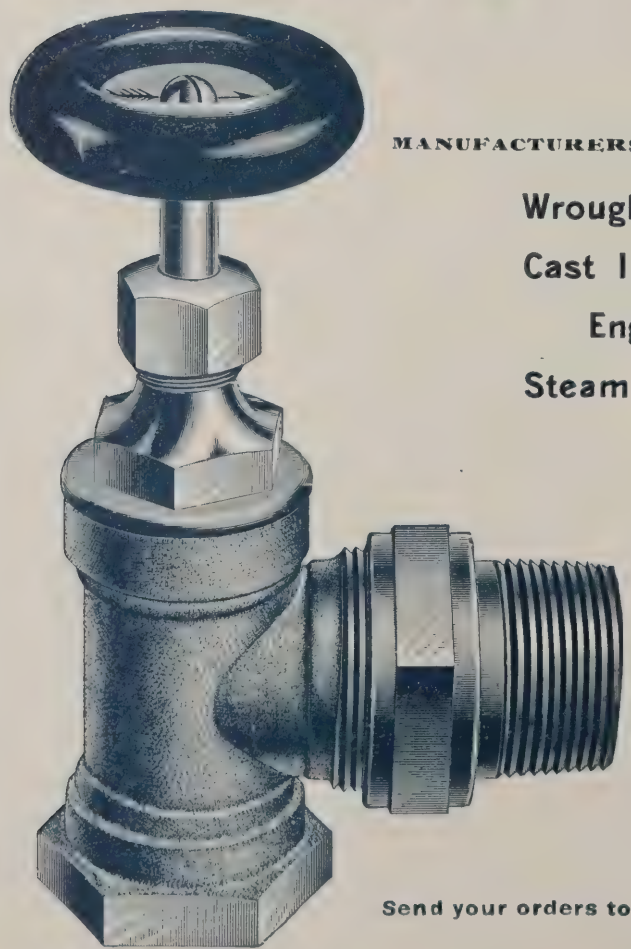
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Push down turn ⅛ to right.

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SATISFACTION GUARANTEED.

It Saves from 15 to 25 movements (and much needless profanity).

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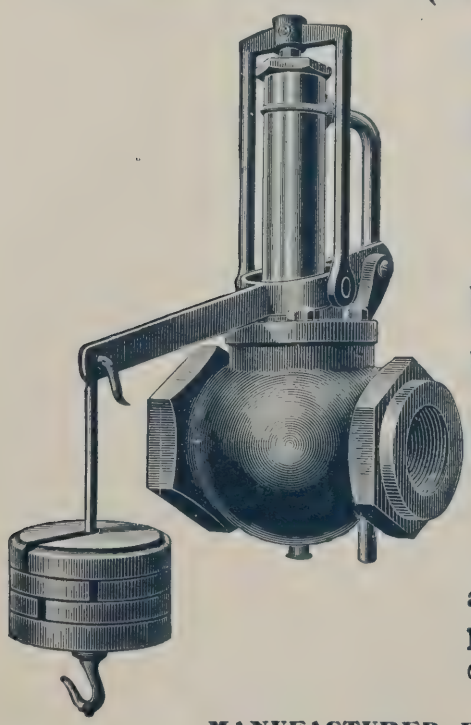
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By the aid of this system the janitor ***in the basement*** knows at all times the temperature of each room in the building and has power to control it. This insures a uniform and constantly even temperature throughout the building, increased life of the heating apparatus, and a great saving of fuel. The Instruments will pay for themselves in from two to three years in amount of fuel saved.

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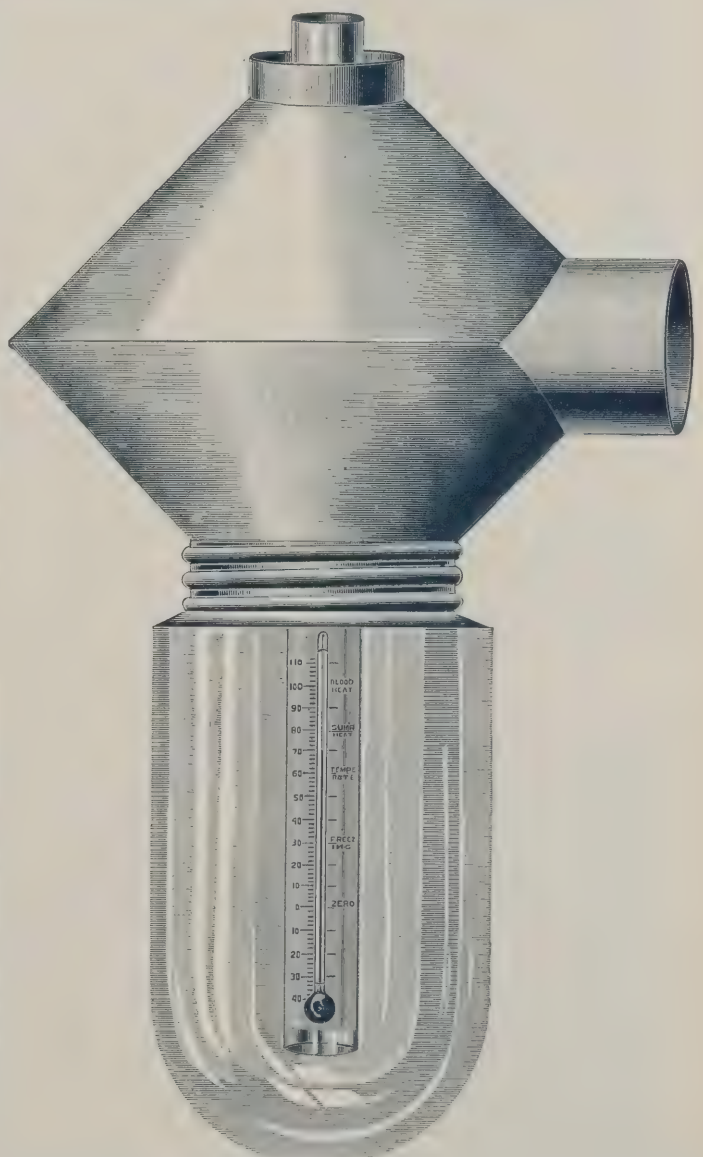
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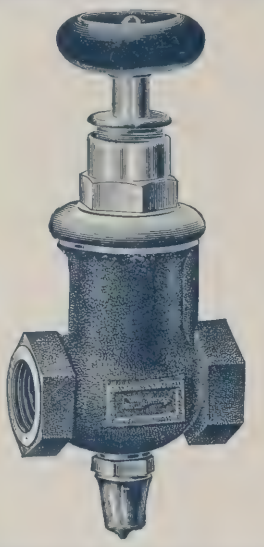
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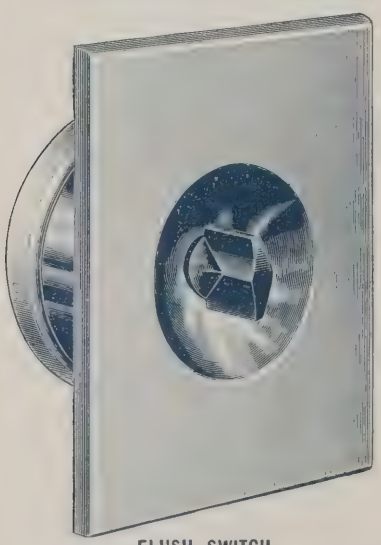
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HART SNAP SWITCHES FOR ELECTRIC LIGHT AND POWER.

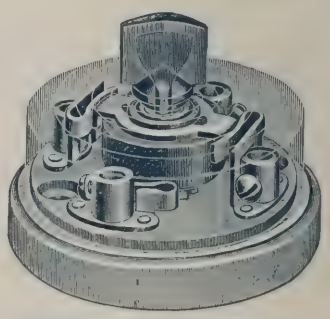
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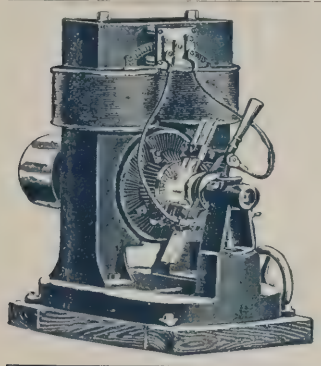
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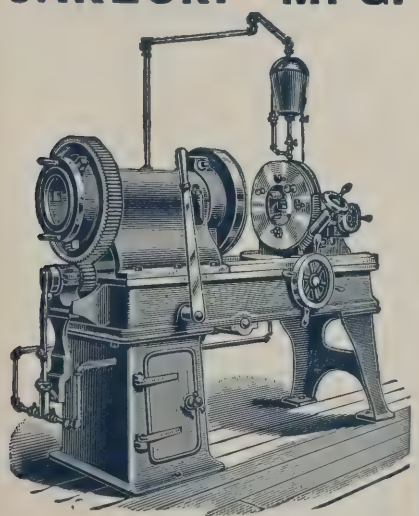
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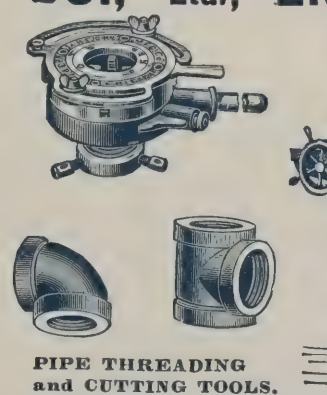
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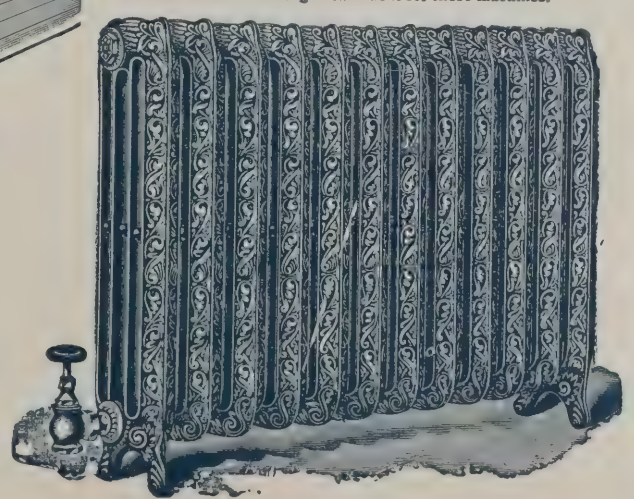
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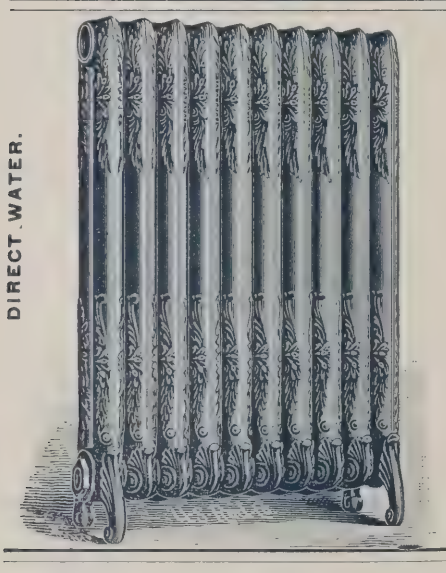
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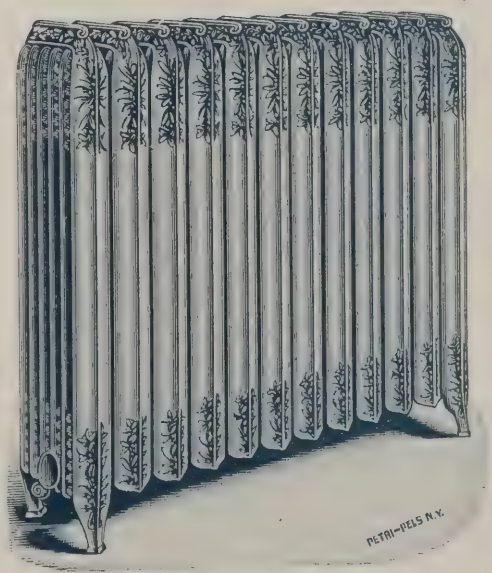
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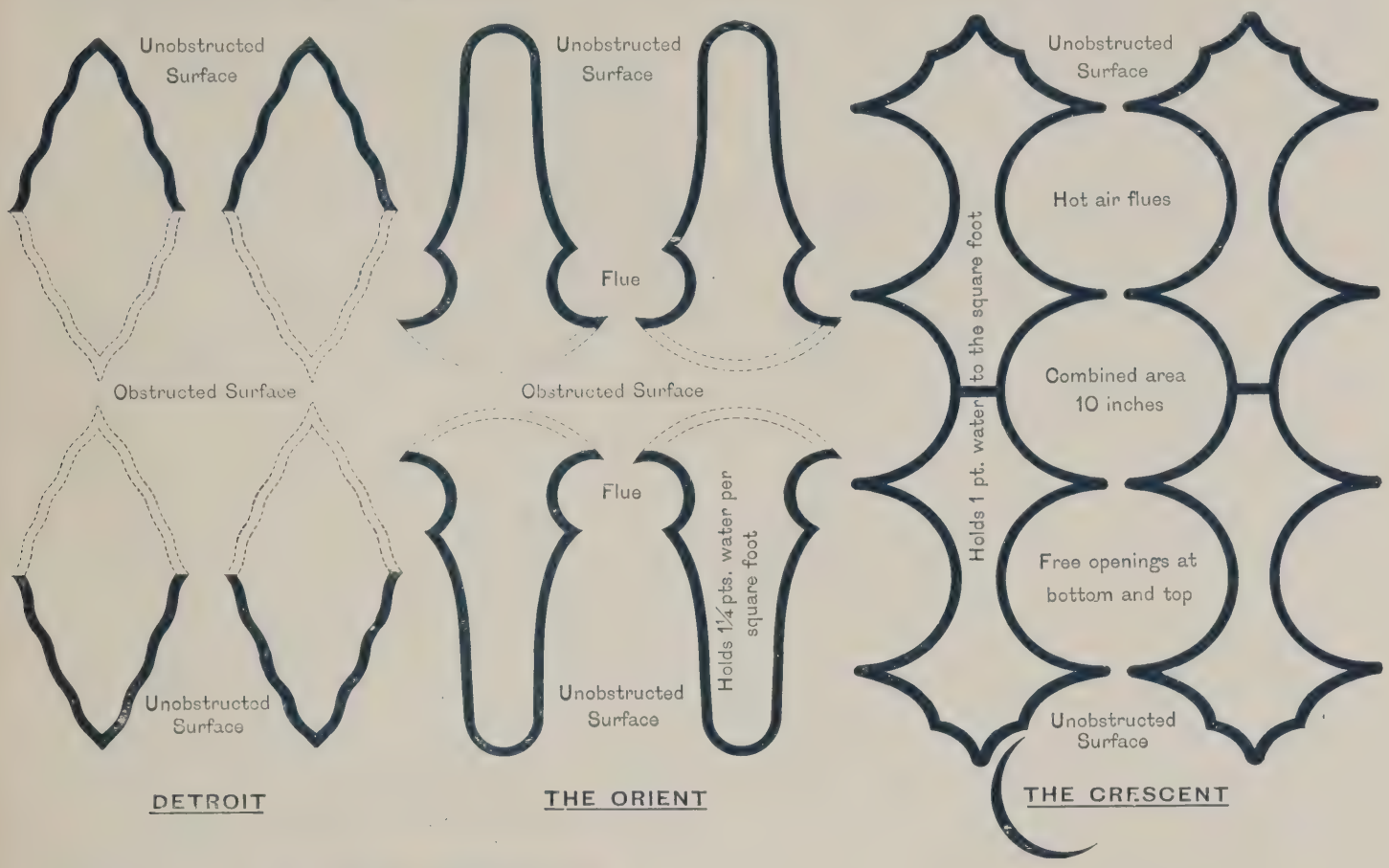
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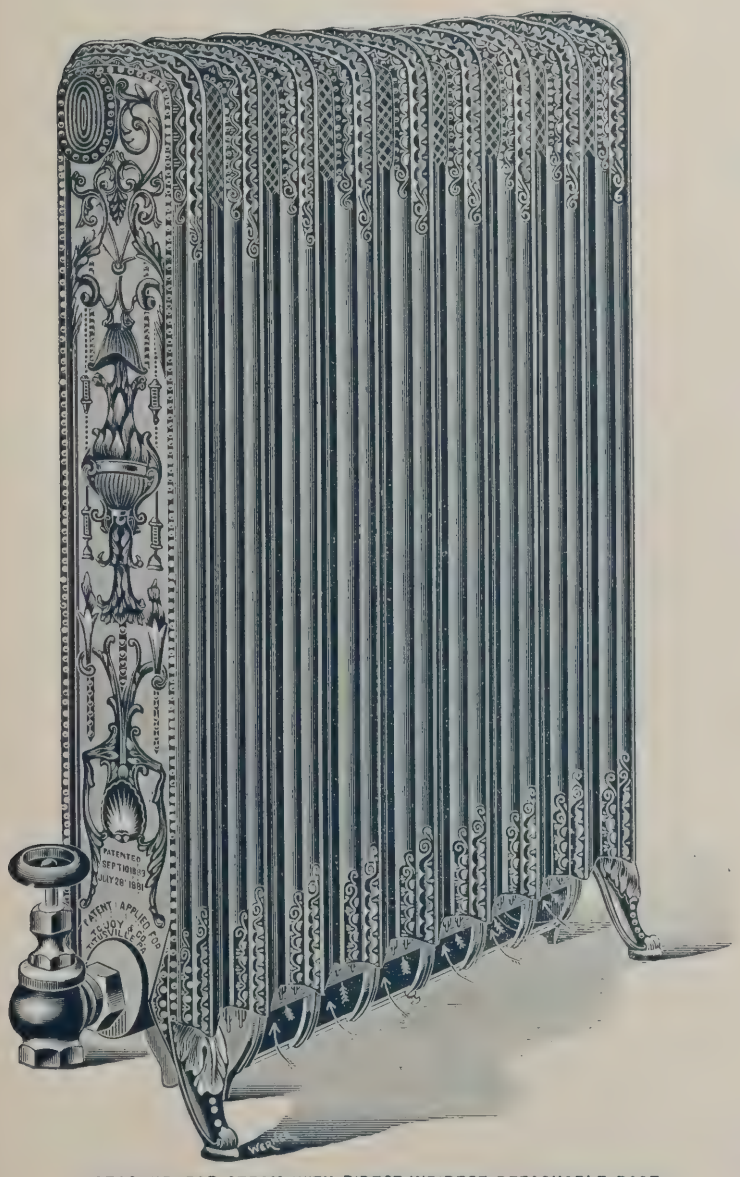
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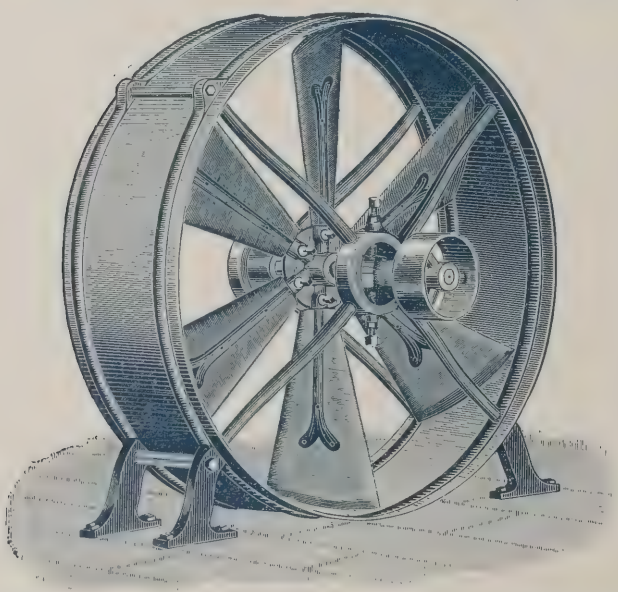
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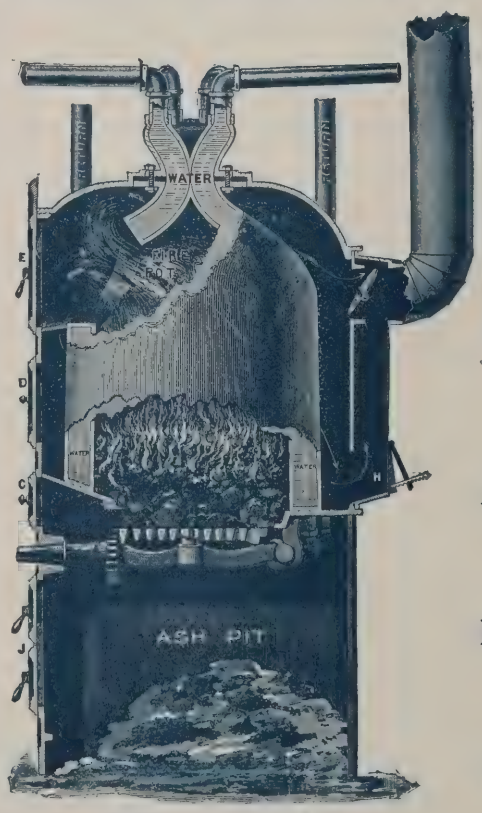
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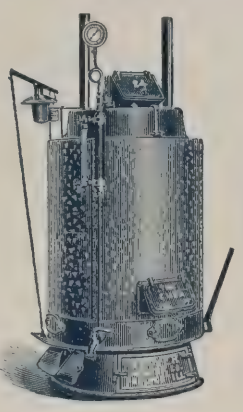
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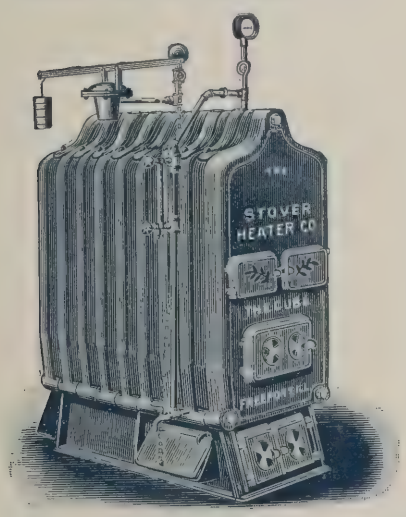
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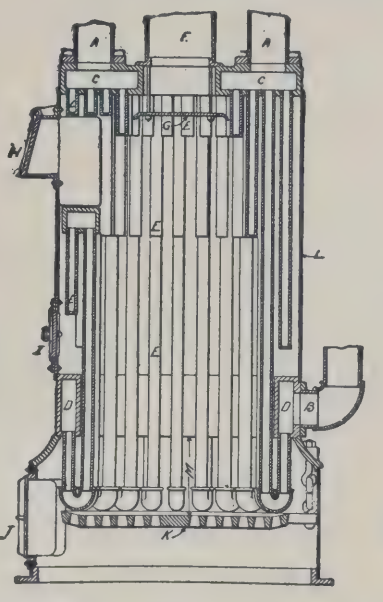
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With our half-inch wrought iron pipe radiation, will respond to fire as readily as a stove.



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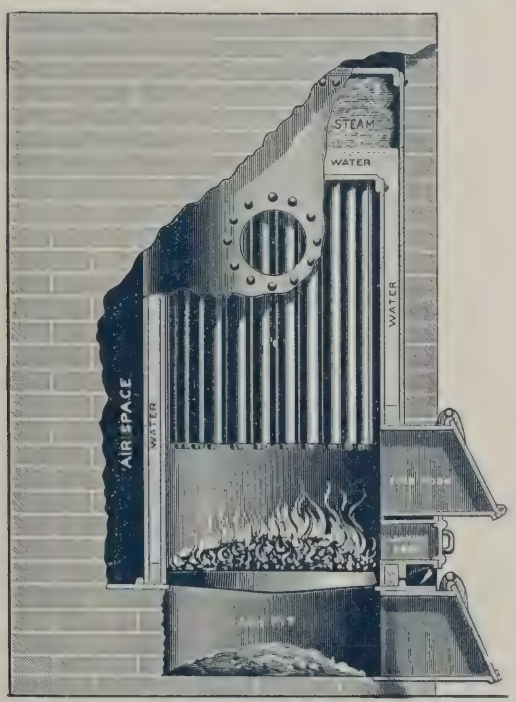
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B—Return.
C—Upper Water Ring.
D—Lower Water Ring.
E—Drop Tubes.
F—Smoke Flues.
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H—Feed Door.
I—Clean-out Door.
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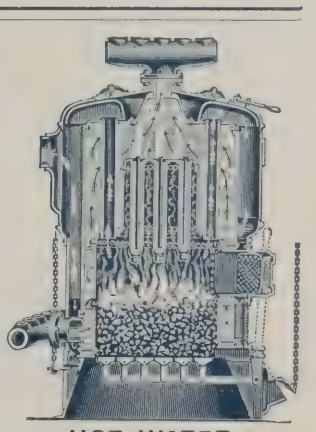
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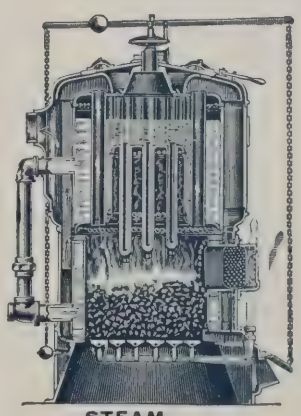
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Positive circulation. Perfect combustion. Economy and steadiness of heat.



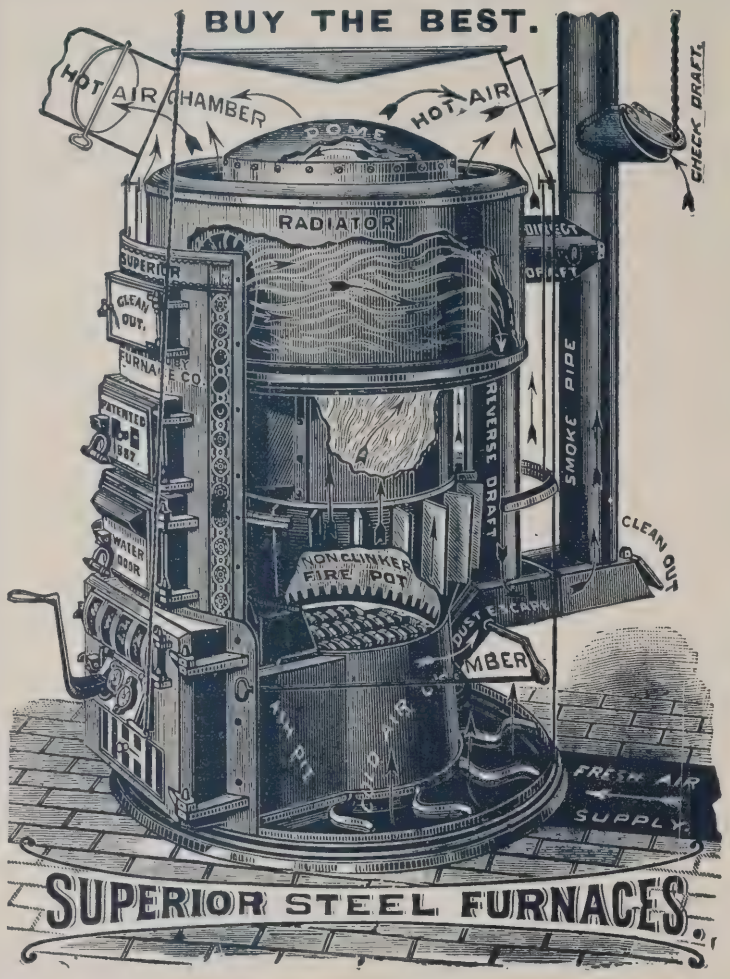
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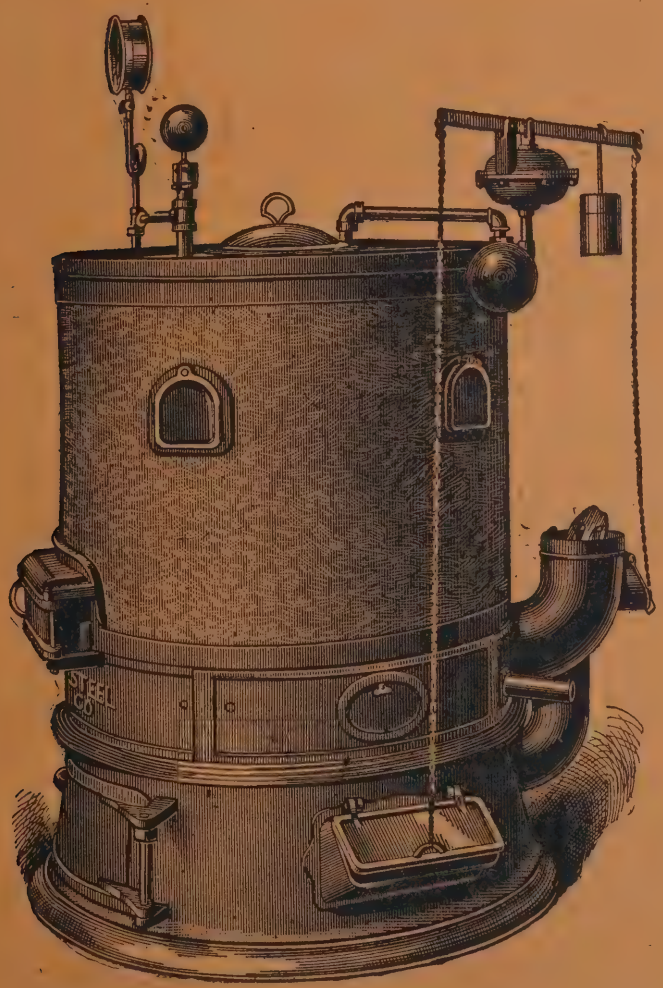
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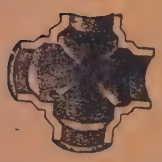
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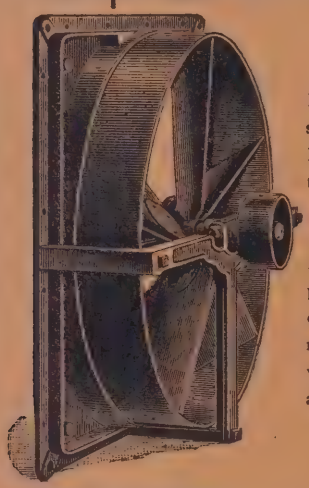




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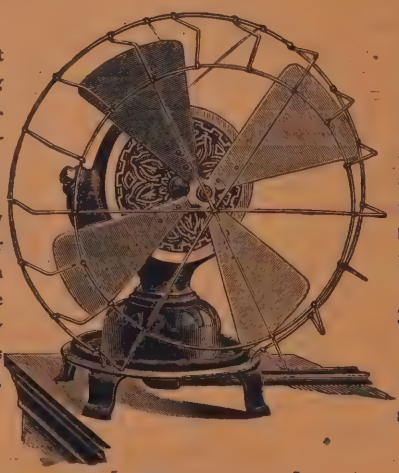


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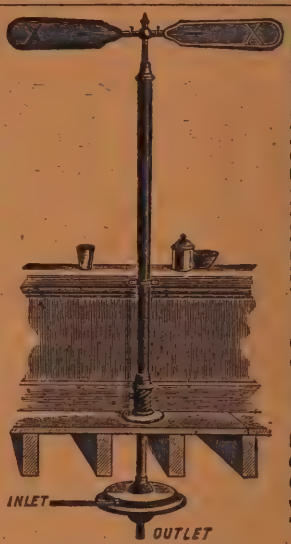


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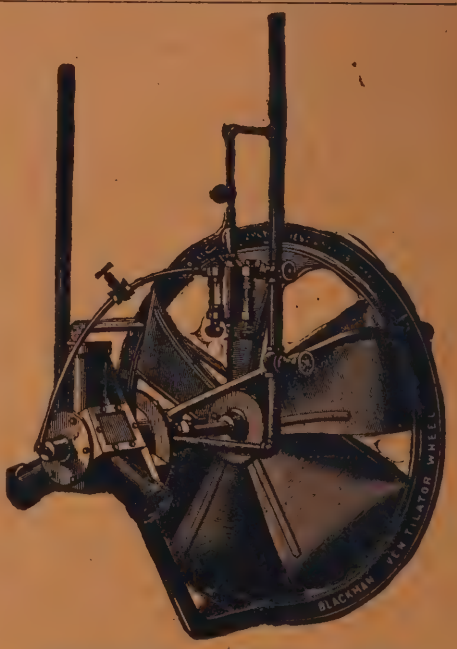
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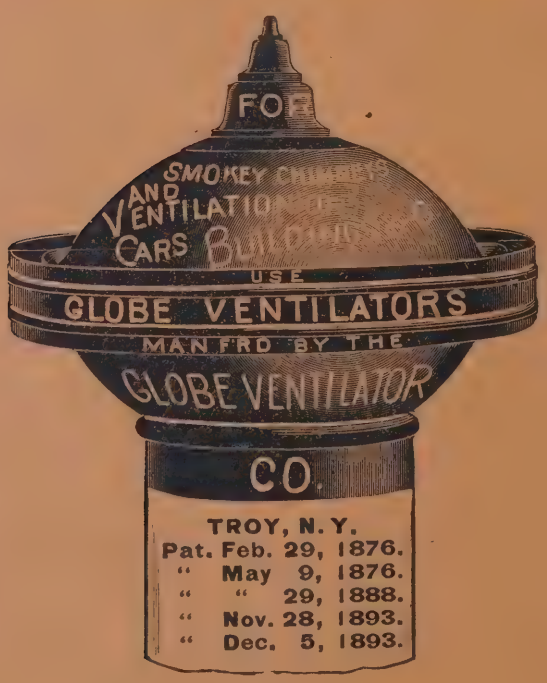
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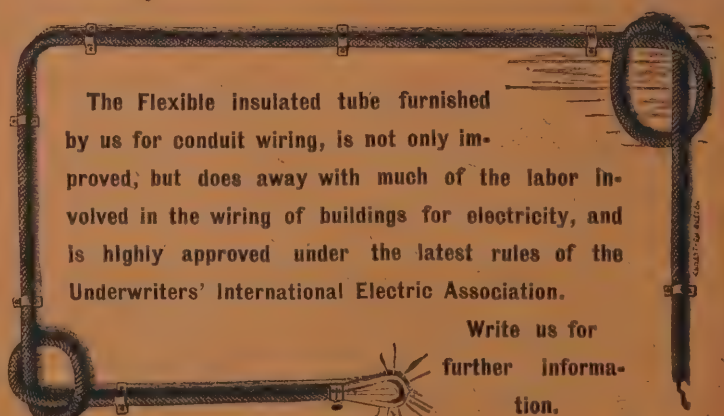
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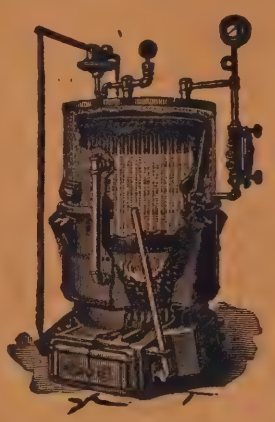
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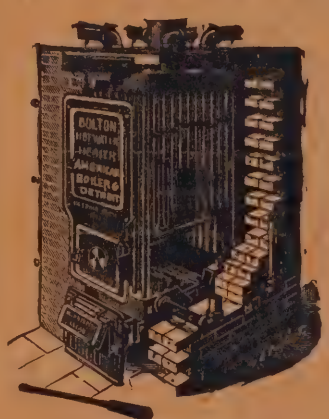
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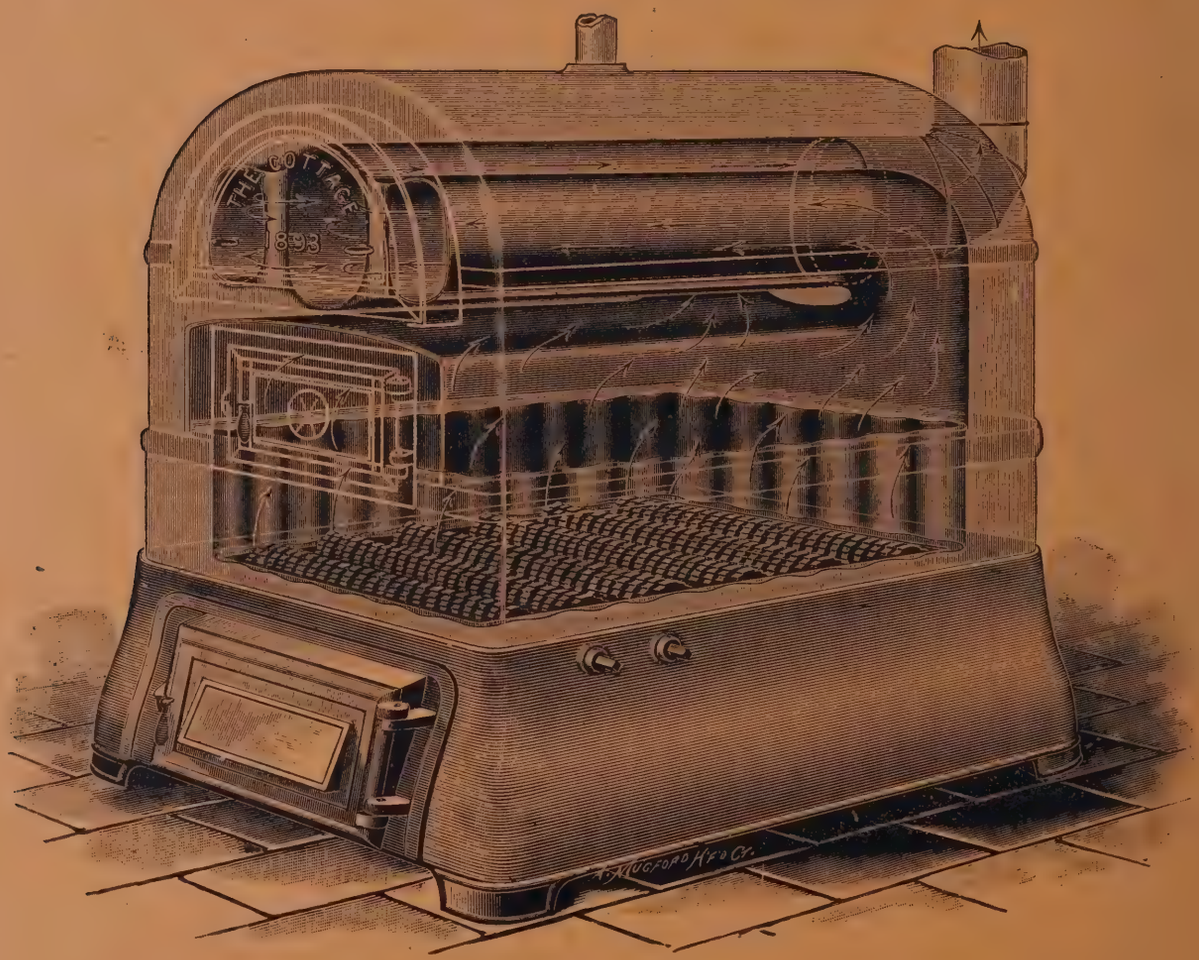
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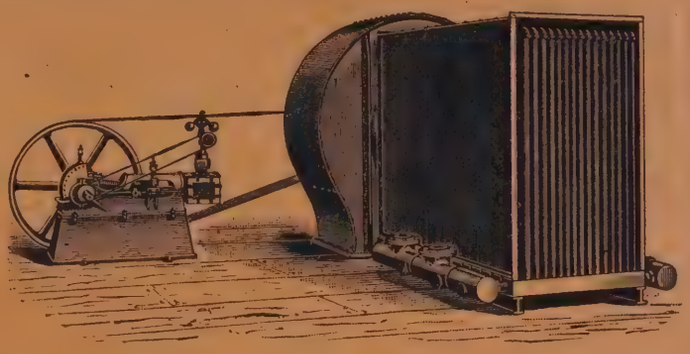
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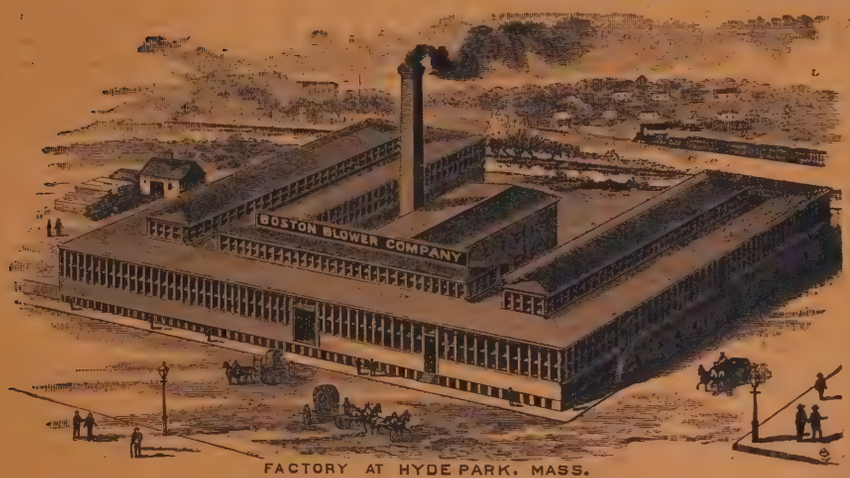
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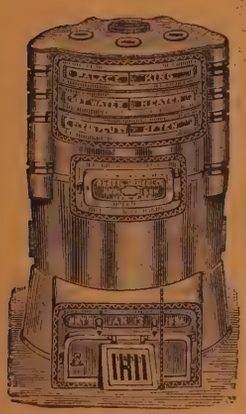
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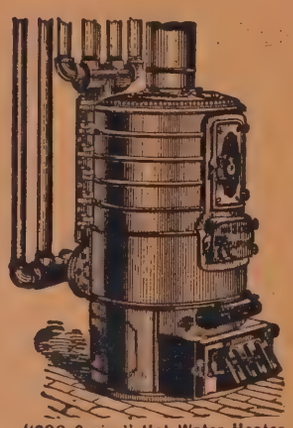
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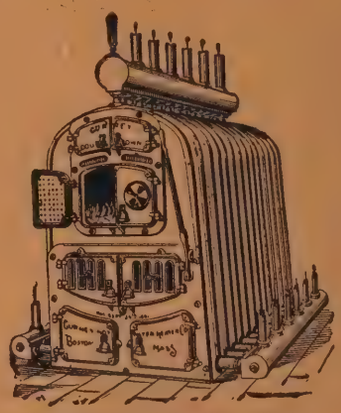
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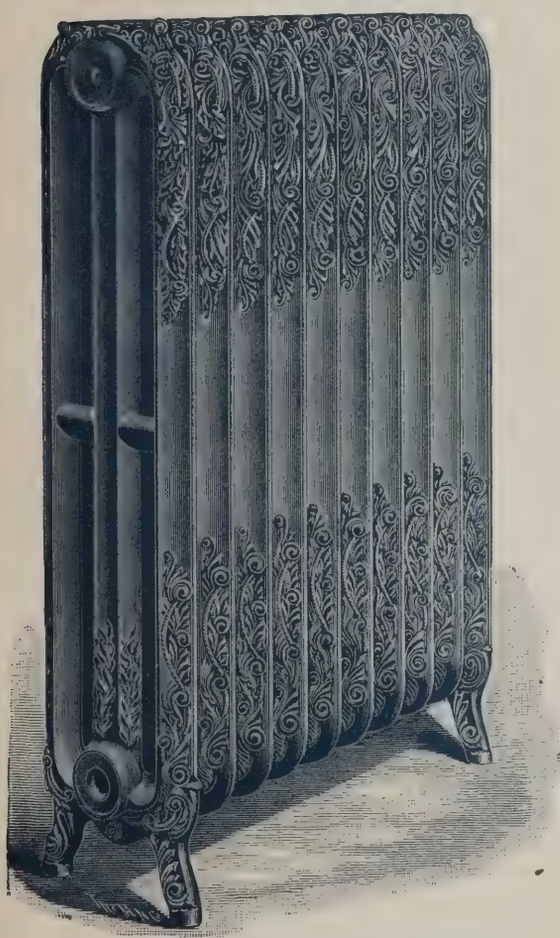
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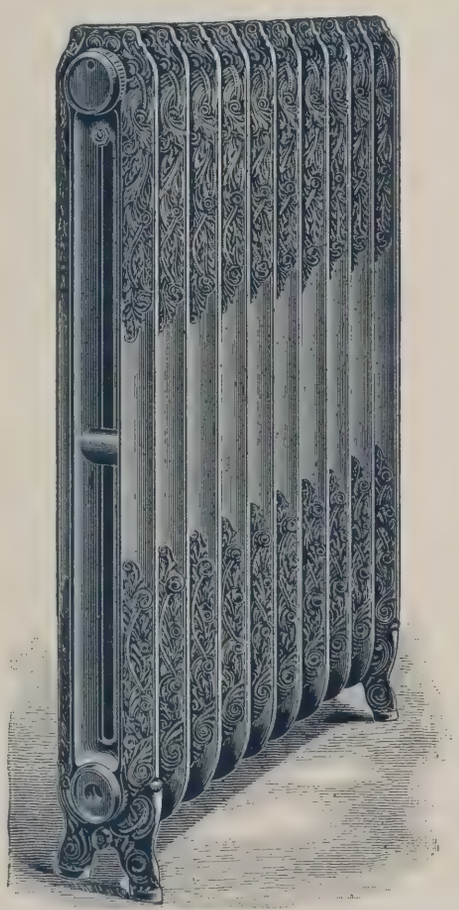
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44 IN. HIGH,
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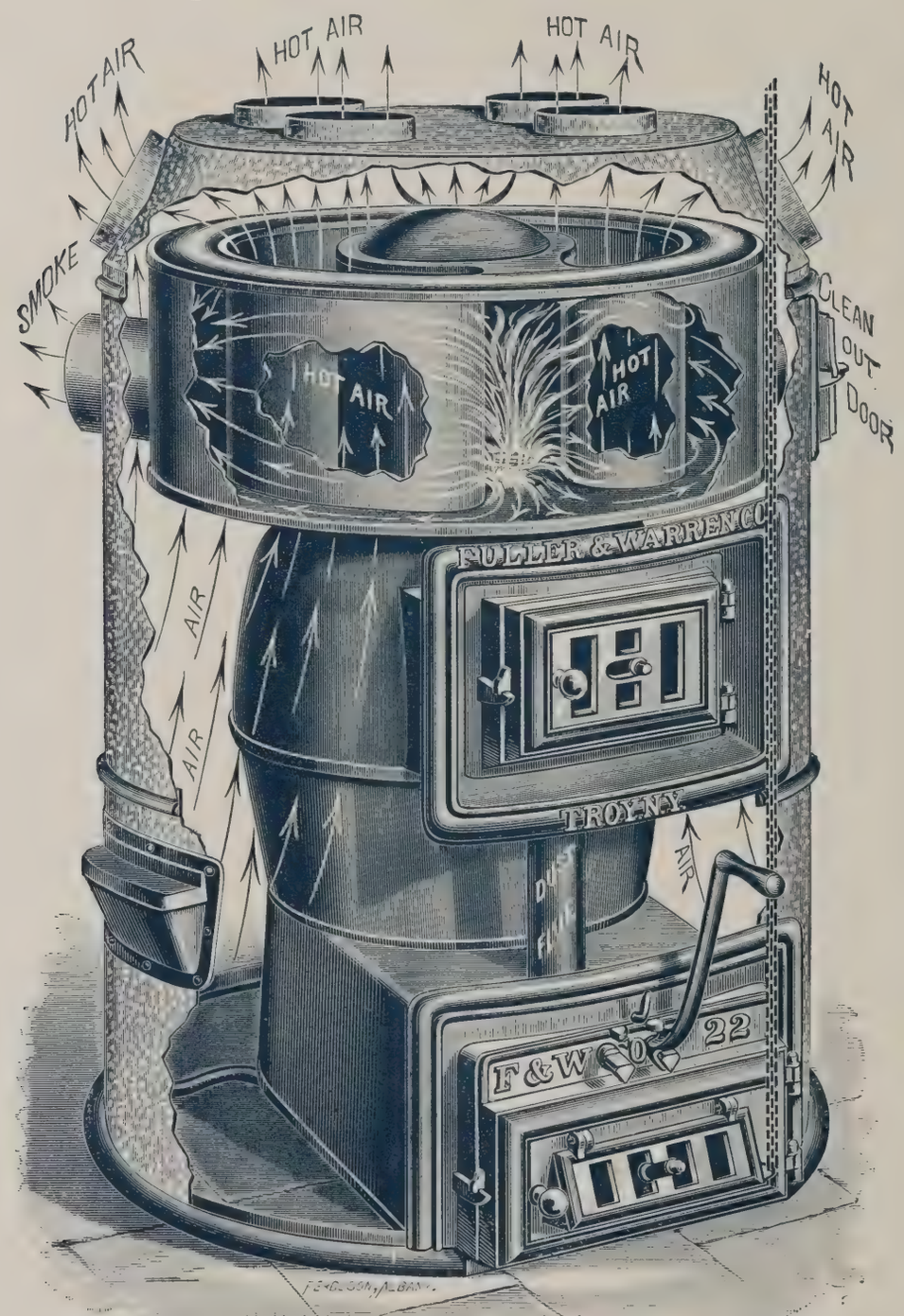
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Absolutely Gas and Dust Tight.



MADE IN TWENTY MODIFICATIONS AND SIZES.

Fuller & Warren Co., Troy, N. Y.

New York. Milwaukee. Boston. Buffalo. Chicago.

WORKS: AVONMORE, PA.

HOLLAND RADIATORS

WORKS: BREMEN, IND.



POINTS

Symmetrical Design, Perfect Castings, Beauty of Decoration, Full Area of Heating Surface, and the Simplest and Most Reliable Connection on the market.

ARE POINTS

Which have gained for the Holland Radiator a deserved popularity, and forced us to build a factory especially for our rapidly increasing Eastern trade.

To those who have used the Holland it is unnecessary to talk: **They Come Again.**

To our friends in the trade who have **not** given us a chance to save them annoyance and expense caused by complicated connections, we say: **Join the Procession.**

WE HAVE JUST OPENED A NEW YORK OFFICE AT

69 CENTRE STREET.

WHERE ALL ENQUIRIES SHOULD BE ADDRESSED.

EASTERN AGENT: THOMAS HOEY, 141-147 SUMNER ST., EAST BOSTON, MASS.

WRITE FOR PRICES. **HOLLAND RADIATOR AND MANUFACTURING CO.**

CHICAGO OFFICE: 75-77 LAKE STREET.

Carton FURNACES AND HEATERS

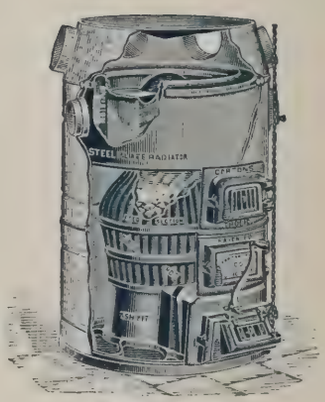
Steam and Hot Water Boilers.



Carton's Junior.

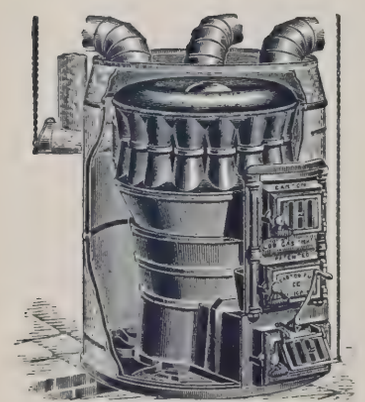
THE

BIG

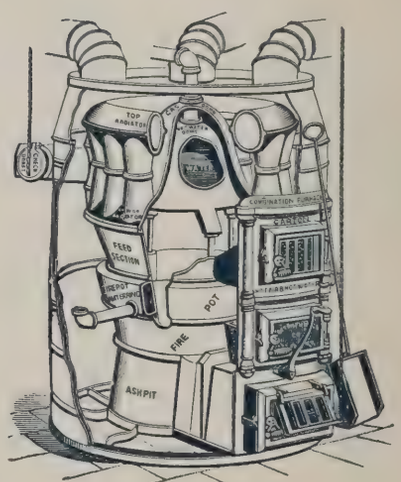


Carton's Tropic.

4



Carton's Low Gas Tight.



Carton's Combination.

OUR HEATERS ARE ALL GUARANTEED.

Sold on their MERITS for the PAST 47 YEARS. All the Latest Improvements. The original "SMYTH" Triangular Grate.

WRITE FOR CATALOGUE AND DISCOUNTS. Also our Book "PUBLIC OPINION." Let us mail you our price list on Furnace Fittings.

MANUFACTURED BY

CARTON FURNACE CO., Utica, N.Y.

Western Branch, Nos. 83 and 85 Wabash Avenue, CHICAGO, ILL.

ESTABLISHED IN 1847.

Twenty=five Years

In the Steam and Hot Water Heating Business enables us to give you the longest experience and the best possible advice.

Realizing that this is an age of progression, and that there was an opportunity for improvement in the construction of Steam and Water Heaters as well as in other lines, we constructed the **"ROYAL"** Steam and Hot Water Heaters, based on a knowledge of the requirements, gained in a quarter of a century of successful practical experience.

The **"ROYAL"** Heaters were first presented to the public in 1892, being **"sold on their merits and not on their antiquity."**

The **"ROYAL"** Heaters have been placed in all sections of the country, from Maine to Oregon, by some of the leading Fitters.

There are hundreds of the **"ROYAL"** Heaters in use, and the results and economy of fuel which they have shown, fully demontrates that their principle of construction is the correct one.

The **"ROYAL"** Heaters being made in our own works, enables us to furnish the best goods at the lowest prices. The intelligent Fitter purchases from the manufacturer and not from the jobbers, saving the middleman s profit.

The question of repairs is a very small part of our business, but having our own works and patterns, we are always in a position to furnish repairs, promptly, for any goods we have ever made.

Men who consult their own interests will not purchase goods from companies who only exist on paper and whose goods are made in outside foundries, of such materials as the foundryman cares to make them of to insure his profit, when they can purchase direct from the manufacturer who has a reputation to maintain.

Write for catalogues, price lists and discounts.

HART & CROUSE,

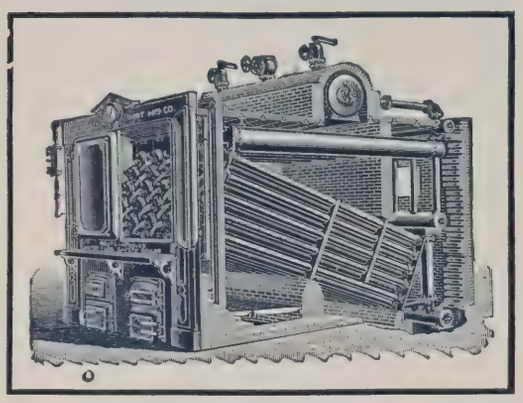
MANUFACTURERS OF ROYAL" HEATERS

79 LAKE ST., CHICAGO, ILL. 78 FAYETTE ST., UTICA, N.Y.

211 WATER ST., NEW YORK.

W. M. MACKAY, Manager Steam and Hot Water Department.

THE ROOT IMPROVED WATER TUBE BOILER



Rapid Steam Generators for Heating

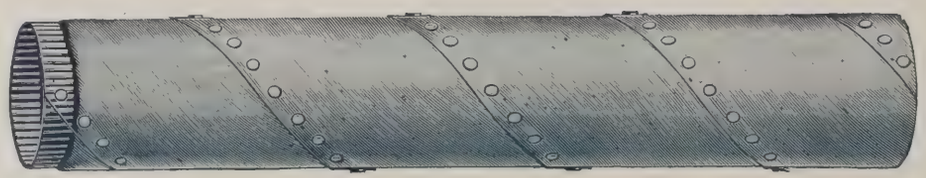
APARTMENT HOUSES, OFFICE STRUCTURES,

. . . . Etc., Etc.

HIGHEST POSSIBLE ECONOMY WITH ABSOLUTE SAFETY.

SPIRAL RIVETED PIPE.

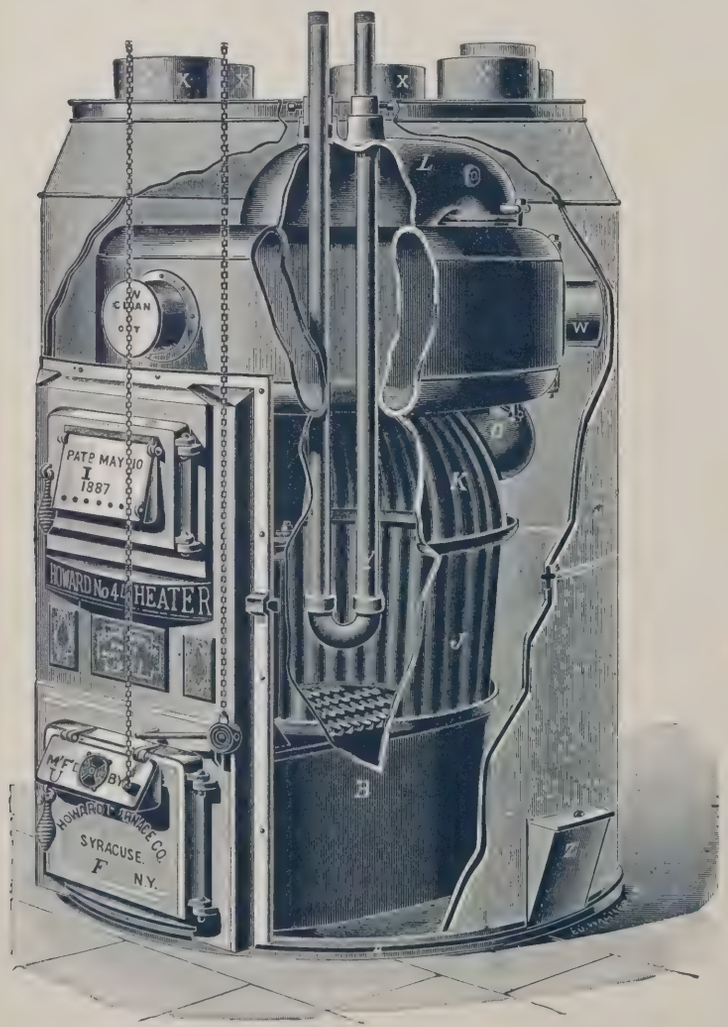
3 to 24 inches in Diameter.



2 to 25 feet Lengths.

For Ventilation, House Leaders, Exhaust Steam, Water Supply, etc.

ABENDROTH & ROOT MFG. CO., 28 CLIFF STREET, NEW YORK.
Send for Catalogue.



THERMAL
HOWARD HEATERS
COMFORT.

WE BEG TO CALL YOUR ATTENTION TO THE DESCRIPTION OF BOILER, FOUND ON PAGE 1 OF THIS PUBLICATION.

HOWARD FURNACE CO.,

MAIN OFFICE AND WORKS:

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BOSTON: 61 & 63 Blackstone St. TORONTO: 337 Yonge St.

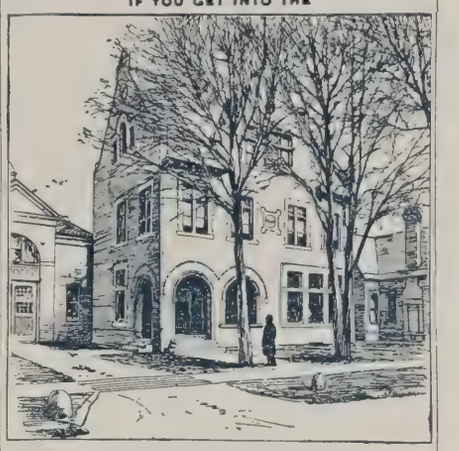


THIS IS THE LITTLE MATCHBOX FURNISHED TO THE DELEGATES AT THE NEW YORK CONVENTION OF M. S. & W. FITTERS, AND THE DETROIT CONVENTION OF MASTER PLUMBERS,

AND THIS IS A USEFUL CARD ENCLOSED IN THE BOXES DISTRIBUTED AT DETROIT.

THIS WILL PAY YOUR FINE

IF YOU GET INTO THE



Elmwood Avenue Police Station.

HEATED BY THE HECLA STEAM HEATER.

UNITED STATES HEATER CO.

UNITED STATES HEATER COMPANY,

115 Randolph Street, DETROIT.

NEW YORK. **CHICAGO.** **BOSTON.**

OUR

NEW SECTIONAL

"SUNRAY"

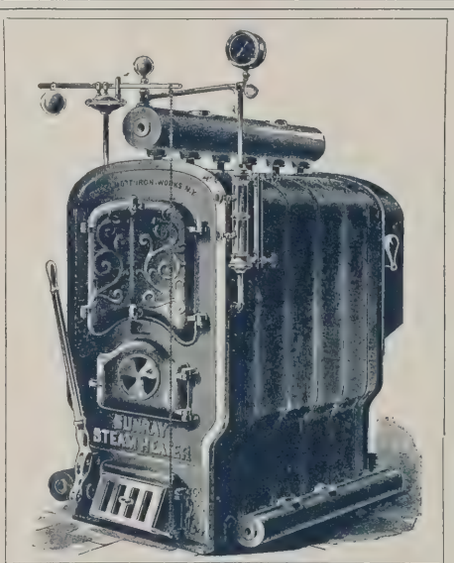
STEAM BOILER

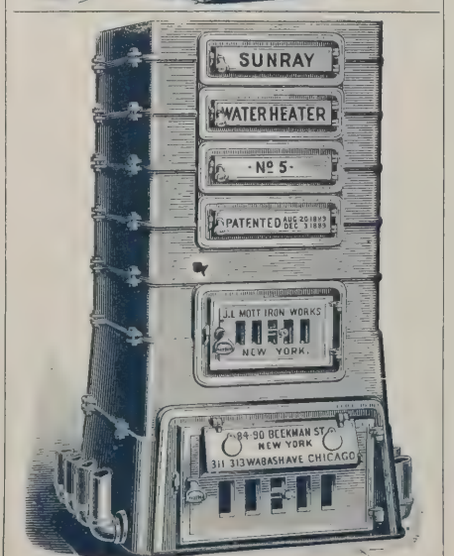
Made to carry from 450 to 2400 feet of Steam Radiation.

HAS MORE TALKING POINTS THAN ANY OTHER BOILER.

It is the easiest to sell, the easiest to put up, the most satisfactory to handle.

THE ONE THAT WILL ALWAYS GIVE SATISFACTION TO YOUR CUSTOMERS.





VICTORY

—) AND (—

CONTINUED SUCCESS

ALWAYS ATTEND THE DEALERS WHO HANDLE OUR

"SUNRAY"

WATER HEATERS.

No heater has ever been so successful.

OVER 1,000 IN USE AND EVERY ONE GIVING THE BEST OF SATISFACTION.

SEND FOR NEW CATALOGUE AND PRICE-LIST.

The J. L. MOTT IRON WORKS,

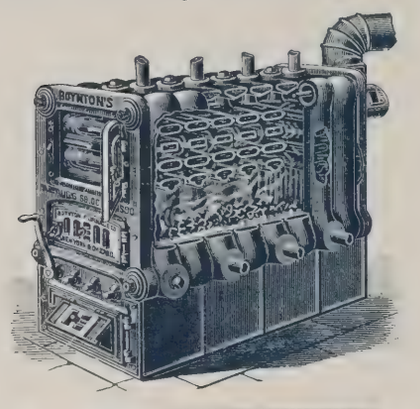
84-90 BEEKMAN ST., NEW YORK.

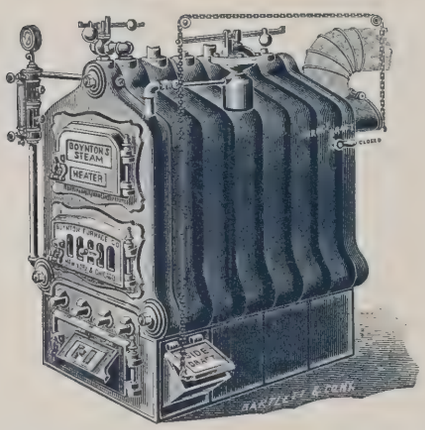
311-313 WABASH AVE., CHICAGO.

ESTABLISHED 1849. GOODS UP TO THE TIMES. INCORPORATED 1884.

THE BOYNTON FURNACE CO.

Are the only manufacturers of the Genuine and Latest Improved





BOYNTON

HOT WATER HEATERS
STEAM HEATERS
FURNACES
RANGES, ETC.

and all goods bearing that name fully warranted.

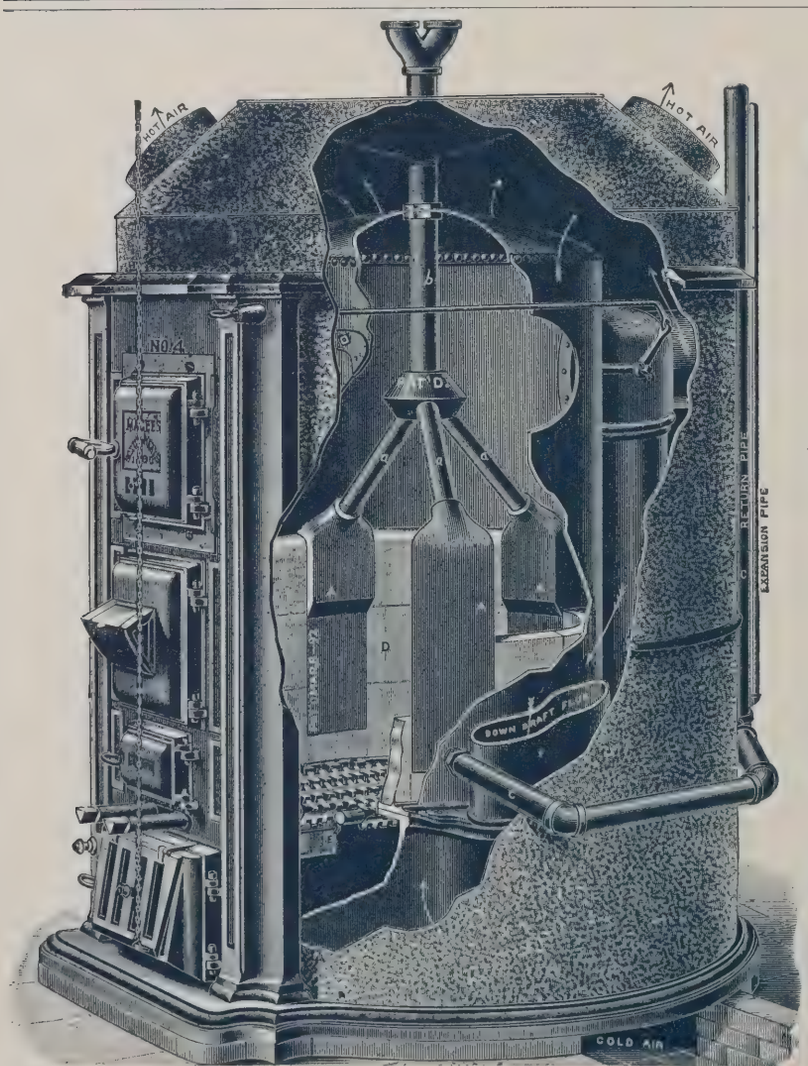
Make Sure that BOYNTON FURNACE CO. are the manufacturers of the heating apparatus you purchase. They are for sale by the best dealers all over the United States. Our catalogue free. Better send for it, indicating the style of heating desired.

THE BOYNTON FURNACE CO.

195 & 197 Lake St. CHICAGO.

207 & 209 Water St. NEW YORK.

NOTE.—The Boynton Furnace Co. manufacture Steam and Hot Water Heaters and Furnaces of special construction which are guaranteed to operate successfully with soft coal for fuel.



THE

MAGEE FURNACE CO.

is one of the oldest makers of

☼ FURNACES ☼

in the country. We have used combined *hot water* and *warm air* in heating for more than *25 years*. Our present system is the result of long experience, and is as near perfection in every particular as it is possible to attain.

Let us send you some of the letters we have received from enthusiastic users. It will pay *YOU* to control the sale of the *MAGEE* line in your town.

MAGEE FURNACE CO.

32-38 UNION STREET, BOSTON, MASS.

242 WATER STREET, NEW YORK.

86 LAKE STREET, CHICAGO, ILL.

THATCHER

THE CELEBRATED . . . .

"Thatcher"

Furnace and Ranges.

GAS-TIGHT.
DURABLE.
ECONOMICAL.

Sold by the trade generally.

Specified by Leading Architects.

Illustrated Catalogue Sent Free.

Also Manufacturers of the

"Champion"

Steam and Hot-Water Heaters.

THE THATCHER FURNACE CO.,
240 Water Street, New York.

Regulate The Temperature!

NOT OF THE WEATHER, BUT OF YOUR HOME OR OFFICE.

Overheating and a Sudden Change in Temperature IS BAD!
A Uniform and Even Temperature IS GOOD!
When it is Done Automatically and Economically it IS BETTER.

THE HOME CIRCLE is made HAPPY and HEALTHY when no draught or chilly blast from an open window disturbs your wife, your children, or yourself.
THE SCHOOL ROOM is made PLEASANT and HEALTHFUL, instead of being close and disagreeable.
THE ART ROOM is made a SAFE PLACE for all articles that are *easily ruined by irregularity in the Heat Supply.*
THE OFFICE is made COZY and COMFORTABLE instead of being either a sweat-box or a refrigerator.

QUESTION: WHAT WILL ACCOMPLISH ALL THIS?
ANSWER: THE JOHNSON SYSTEM OF AUTOMATIC HEAT REGULATION.

ELECTRICITY,—THE SILENT POWER! It is a part of the **JOHNSON SYSTEM OF HEAT REGULATION,** and is made to perform untiring service in the regulation of temperature, either by direct or indirect radiation, by hot water or hot air, and secure to you all the advantages arising from a temperature that does not fluctuate.

SPECIAL ARRANGEMENT for the regulation of the hot water supply, thus preventing damage to plumbing, bath tubs, etc. Send for Descriptive Catalogue.

REFERENCE AND ESTIMATE PROMPTLY FURNISHED.

THE JOHNSON ELECTRIC SERVICE CO., - - 120 Sycamore Street, Milwaukee, Wis.
THE METROPOLITAN ELECTRIC SERVICE CO., 41 Dey Street, New York, N. Y.
CHICAGO ELECTRIC SERVICE CO., - - - 411 Dearborn Street, Chicago, Ill.
ELECTRIC SERVICE CO., of Buffalo, 128 Erie County Savings Bank Bldg., Buffalo, New York.
NATIONAL ELECTRIC SERVICE CO., - 72 Equitable Building, Boston Mass.

CANTON HEATERS
TRADE MARK.

HOT WATER. STEAM. WARM AIR.

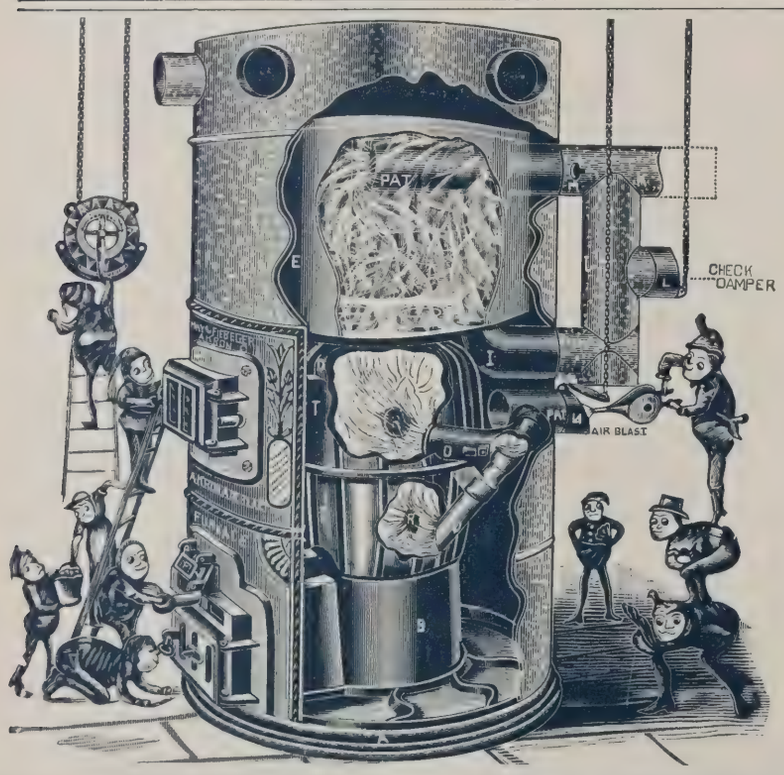
New Catalogue Just Issued.

THE J. H. McLAIN COMPANY.

Factory and Home Office,

CANTON, OHIO.

BOSTON. 191 Ft. Hill Sqr. NEW YORK. 69 Center St. CHICAGO. 88 Lake St. DENVER. 1528 Champa St. SAN FRANCISCO. 4 Crocker Bldg.



76 Furnaces Sold
AND NOT ONE COMPLAINT.
The Akron "Air Blast" Furnace

Has proven a Record Breaker; **even in hard times our agents have been busy.** You should secure agency at once and be in the race at the front.

Read the Following Letter:

OFFICE OF
WELCH & HORTON,
NEW CASTLE, Pa., March 26, 1894.

Messrs. May & Fiebeger,
Akron, Ohio.

GENTLEMEN:—We took the agency of the Akron Air Blast Furnace late in the season of 1891, and have sold up to the present time 76 Furnaces and have not had a complaint from a single furnace, which we consider is the best recommendation the furnace can have. Our furnace trade has been affected less by the hard times than any other line of goods we handle, which shows that people always find the means with which to buy a good article.

The Akron Air Blast Furnace has established a reputation for itself through Lawrence County that other furnaces cannot overcome, and when they make a sale it is to parties who look at price and not the furnace. We know that we have the best furnace on the market to-day and our customers know it, too. Wishing you success for 1894, we remain, Yours respectfully,

WELCH & HORTON.

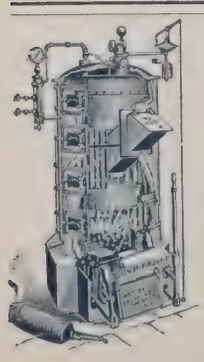
Welch & Horton's Sales have been:

8	Akron Air	Blast	Furnaces	in 1891.
30	do	do	do	1892.
38	do	do	do	1893.

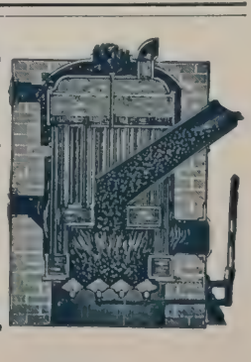
M. & F.

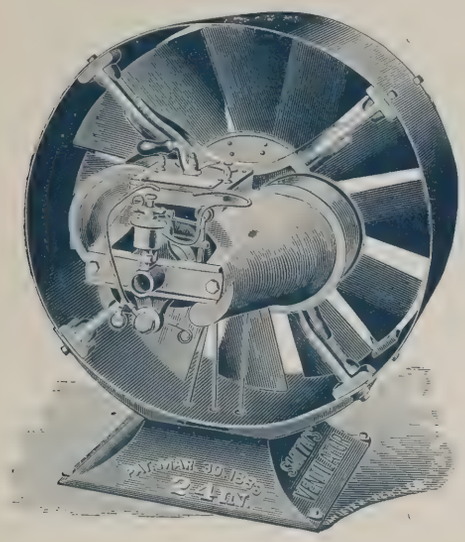
Write for Catalogue. Secure the Agency before some live competitor of yours gets it.

MAY & FIEBEGER, Mfrs.
116 & 118 N. Howard St., AKRON, OHIO.



THE BRONSON WATER-TUBE BOILER.
FOR STEAM OR HOT WATER.
Portable or Brick Set. 54 Styles and Sizes.
SEND FOR CATALOGUES AND PRICES.
WESTON ENGINE CO., PAINTED POST, N. Y.
CHICAGO: Hoffman-Russell Co., 82 Lake St.
NEW YORK: Barron Steam Heating Co., Cable Building.





A BLESSING TO MANKIND

—IS THE—

Smith Patent Steel Disc Ventilating Fan.

TRY ONE IN THAT HOT

OFFICE, STORE, BAKERY, HOTEL, KITCHEN, SCHOOL, THEATRE OR MACHINE SHOP

And see how much more and better work your employees will do.

Furnished with direct attached Electric Motor, High Speed Engine or Pulley for Belt Attachment.

THE HUYETT & SMITH MFG. CO.,

DETROIT, MICH.

HERE IS WHAT THE USERS SAY:

CHICAGO, ILL., November 7th, 1893.

HUYETT & SMITH MFG. CO.,

GENTLEMEN:—We have now operated for some months the ventilating apparatus as furnished by you, and we are pleased tc say that from the first day of its operation it has given us perfect satisfaction.

Before entrusting our order to you, we made a thorough investigation of the various fans and systems for such ventilating work as we required. and we are now confident we made the proper selection.

Your fan requires but very little power to run it, and its general construction is superior to anything we have seen. We congratulate you on not only having what we consider the best ventilating apparatus, but also that you have in your employ experts who so thoroughly understand the application and installation of same.

THE ALDRICH BAKERY. **AMERICAN BISCUIT AND MFG. CO.**

WRITE FOR CATALOGUE.

THE HUYETT & SMITH MFG. COMPANY,

DETROIT, MICH.

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LONDON, ENG.: 70 GRACECHURCH STREET.

ARE YOU SATISFIED

With your present System of Steam Heating?

WE ARE SATISFIED

That any System of Steam Heating can be greatly Improved by the application of the

ANDREW G. PAUL SYSTEM FOR REMOVING AIR.

A Saving to Manufacturers.

Circulation of Exhaust Steam without Back Pressure.

A Help to Contractors.

Perfect Circulation Guaranteed.

A Comfort and a credit to Engineers.

A Sure Saving of Fuel.

A Benefit to all Steam Users.

The most economical system of heating by Steam.

NOISELESS. QUICK. POSITIVE.

The system as may be seen in operation at our office can be easily applied to any old Steam Heating Plant.

NEW ENGLAND ENGINEERING CO.

No. 79 Milk Street, - - Boston, Mass.

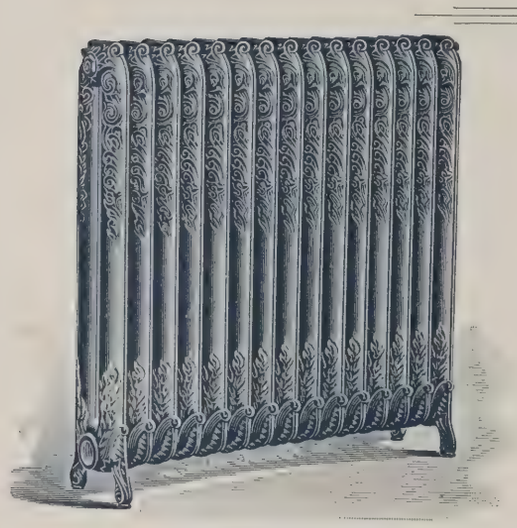
CORRESPONDENCE SOLICITED ESTIMATES FURNISHED.

THE

AMERICAN RADIATOR COMPANY

Largest Makers of Radiators in the World.

MANUFACTURERS OF



PERFECTION.

World Renowned

AMERICAN RADIATORS

(Trade Mark.)

Direct, Indirect,

and Direct-Indirect

RADIATORS

For Steam and Hot Water.

SEND FOR

New Price List

and

Note Reductions.

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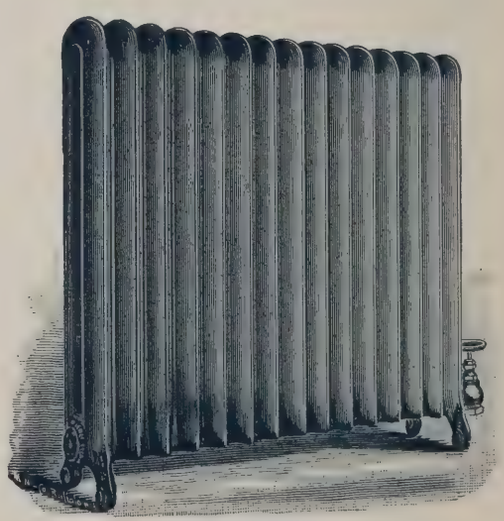
Our Facilities Unequaled.

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Smooth Castings,

Handsome Designs,

Perfect Construction.



PEERLESS.

GENERAL OFFICES,
111 AND 113 LAKE STREET,
CHICAGO, ILL.

BRANCH OFFICES:

NEW YORK,
92 Centre Street.

MINNEAPOLIS,
330 First Street, North.

BOSTON,
44 Oliver Street.

DENVER,
1810 Blake Street.

FACTORIES:

DETROIT AND BUFFALO.

Heating and Ventilation

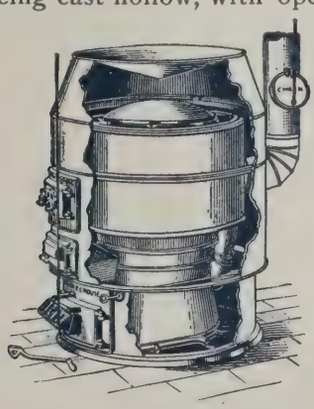
NEW YORK. (Copyright, 1894.) JULY 15, 1894. (All rights reserved.) CHICAGO.

Furnaces and Combination Heaters.

SCARCELY any subject with which the heating trade has had to deal has received more attention than has the design and construction of furnaces and combination heaters. That the conception of the fundamental principles underlying the construction of this class of apparatus differs as widely as the natural characteristics of the persons who attempt to apply them is made plainly evident by the various designs with which we are confronted, in each of which, we are told, every correct principle of construction is embodied. Without commenting upon what features are or are not necessary to a successful application of the principles involved, we present this month an illustrated description of a few of the furnaces and combination heaters now on the market, believing that a careful perusal of the descriptive matter, and a close examination of the cuts, cannot fail to be of interest and of value alike to student, engineer, manufacturer, and prospective buyer.

PRINCE ROYAL FURNACE AND COMBINATION HEATER.

Above the fire pot, which is of cast iron, the Prince Royal hot air furnace is constructed of the best quality of steel plate, the radiator being made in such a way that the products of combustion are compelled to traverse its entire circumference before reaching the smoke exit. The fire pot is in three sections, the connections being made by means of deep cup joints packed in the usual manner. Palmer's triangular duplex grate is used, each bar being cast hollow, with openings



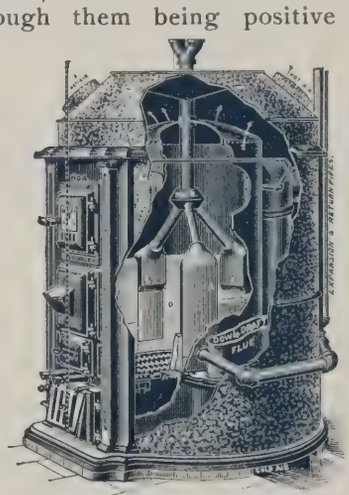
Prince Royal Hot Air Furnace.

from each surface, through which air constantly passes, thus insuring the bars against warping. At the rear of the base a dust flue, with damper, furnishes an outlet for dust when the grate is shaken, while access for cleaning may be had from the smoke collar in the rear and clean-out collar in



Prince Royal Combination Heater.

front. In the Prince Royal combination heater a cast iron boiler of three sections is suspended directly over the fire, as shown. The water enters the lower section, passing through that to the next section, thence to the upper section, and out through the flow pipe to the radiators. The sections are connected by means of wrought iron nipples, the circulation of water through them being positive and

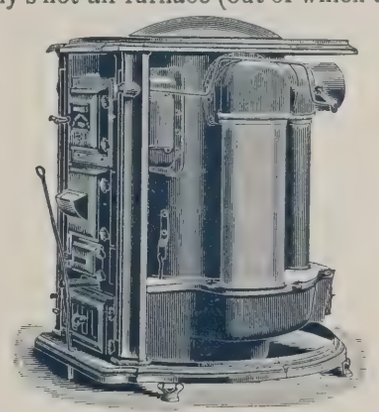


Magee Combination Heater.—Fig. 1.

rapid, the sections being exposed to the direct rays of the fire. In addition to the heaters described, the manufacturers, Hart & Crouse, Utica, N.Y., make the Royal, Royal Victor, Imperial, Pleasant Home, and Stirling furnaces.

MAGEE FURNACE AND COMBINATION HEATER.

The combination heater shown by Fig. 1 is made of wrought iron with a brick lined fire pot. The three hollow iron water sections *A* alternate with the fire brick, upon the lower layer of which they rest, without reducing the diameter of the fire pot. A hollow disk above the center of the fire receives the water from sections *A* through pipes which connect them to the disk as shown. As this disk is directly over the fire it gets the full benefit of the products of combustion. The water passes from the disk to the outlet at the top of the heater and thence to the radiators above. By this construction a rapid vertical circulation is secured. The cold air from the outside, entering the cold-air duct at the bottom of the heater, is warmed as it passes between the casing and the radiator of the furnace, supplying a large amount of pure, warm air to the rooms above. The Magee Furnace Company of Boston, Chicago, and New York, are the manufacturers. A good idea of the company's hot-air furnace (out of which this

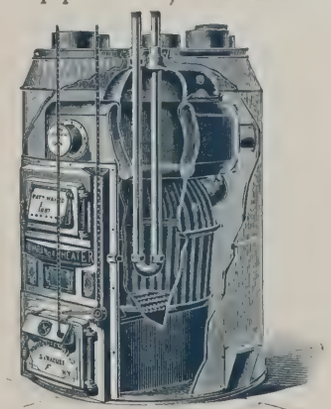


Magee Furnace.—Fig. 2.

combination heater is made, by the simple addition of the water sections and disk) may be obtained from Fig. 2, which shows that a down draft is secured by means of two outside flues or radiators connected at each side with a circular flue at the base, this in turn being connected with the chimney by a third perpendicular flue at the rear

HOWARD COMBINATION HEATER.

The single radiator warm air and hot water heater shown in the accompanying cut consists of a warm air furnace with the addition of an adjustable pipe heater, both main supply



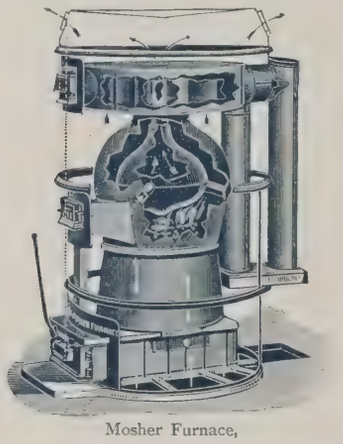
Howard Combination Heater.

and return pipes of which enter the heater through the top or smoke flue section, passing through stuffing boxes

at this point. The construction of the radiator is such that it can be easily cleaned. The fire pot is large and capable of holding a great amount of fuel, the consumption of which, by a simple arrangement of dampers, can be controlled so as to insure its use without waste. The hot water heating apparatus having once been filled requires no further attention, there being no loss of water from circulation. The Howard Furnace Co., of Syracuse, N. Y., are the manufacturers. In addition to the type of hot air furnace which this cut serves to illustrate, the company manufactures other styles of furnaces in a great variety of sizes.

THE MOSHER FURNACE.

The construction of the furnace shown by the accompanying cut is simple, a rapid circulation of air being induced by a central hot air chamber, arranged within the combustion chamber,

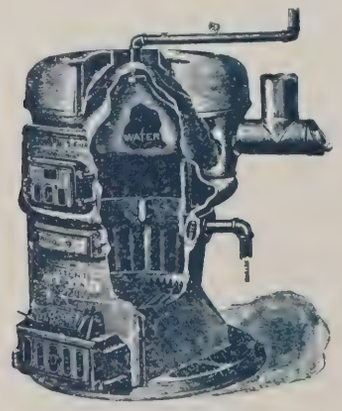


Mosher Furnace,

as shown, which takes air from the hot air space surrounding the furnace through four openings in its sides, and discharges it, highly heated, into the top of the hot air space. The discharge of this current of highly heated air insures a very rapid movement of the large volume of air which is drawn in at the bottom and discharged at the top of the furnace. The manufacturers, M. J. & M. R. Mosher, Troy, N. Y., state that no bolts are used, that there are no flues to fill up, and that there are no joints except self-packing ones between the fire pot and dome, both of which are extra heaay.

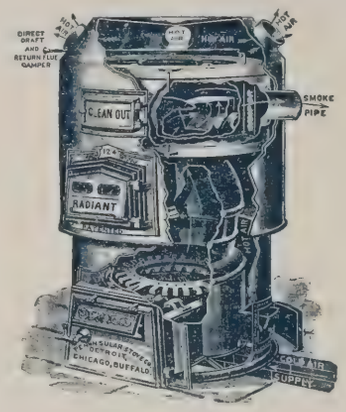
PENINSULAR FURNACE COMBINATION HEATER.

As shown to the right of the accompanying sectional cut, the fire pot of



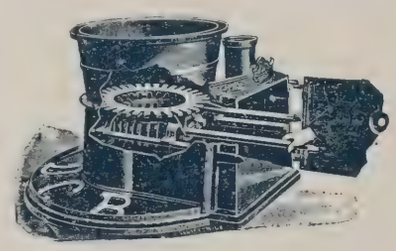
Peninsular Furnace.—Fig. 1.

the heater is surrounded by a hollow casting or water ring, into which the return water flows through the return pipe shown, and from which the water passes through wrought steel pipes to the reservior, which is directly over the fire, and so arranged that the products of combustion pass around its entire surface. The reservior can be readily filled or emptied at will, thereby enabling the furnace to be left idle if necessary during the winter, so as to prevent freezing when the occupants of the building are away for any length of time. The Peninsular Stove Co., of Detroit, Chicago, and Buffalo, are the manufacturers. The Radiant Peninsular furnace which this company manufactures is adapted for using hard or



Radiant Peninsular Surface.—Fig. 2.

soft coal, coke, or natural gas. The cut, Fig. 2, shows the internal arrangement of the furnace, one of the features of which is the return flue radiator, in which the heat is made to encircle the radiator before it passes into the smoke pipe. The radiator is also supplied with a damper, by means of which the draft is made to pass directly into the smoke pipe, thus insuring a quick start for the fire, and doing away with any liability of the smoke escaping into the room. The furnace is fitted with the

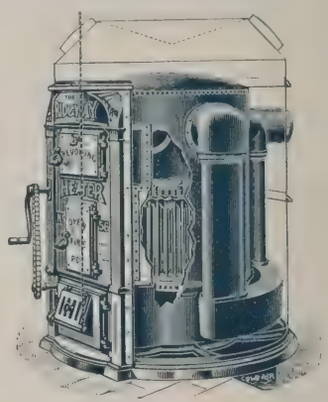


Peninsular Furnace.—Fig. 3.

company's patent duplex grate and annular shaking ring, Fig. 3, which it is claimed will prevent the accumulation of clinkers. The grate is self-mounting, and can be taken out and replaced in a very short time. The furnace is also provided with a double extra heavy fire pot and large ash pit.

THE RIDGWAY FURNACE,

Shown partly in section, is manufactured by the Ridgway Furnace Co., 76 Union street, Boston, Mass. It is provided with a revolving open fire pot, made in sections, which is revolved on balls with little friction by means of a crank at a convenient height. As the grate remains stationary the ashes are removed by turning the fire pot, while a scraper in the front clears away any that may fall through the sides. The draft being both upward and outward, gives complete combustion of fuel. Direct radiation is had from the sides of the fire as well as from the top, as there is no brick lining to obstruct the passage of heat, thus greatly increasing the fire surface. The return base flue is separate from the ash pit, allowing the air to circulate freely, increasing the radiating surface, and admitting of expansion and contraction without disturbing the joints. A direct draft dam-

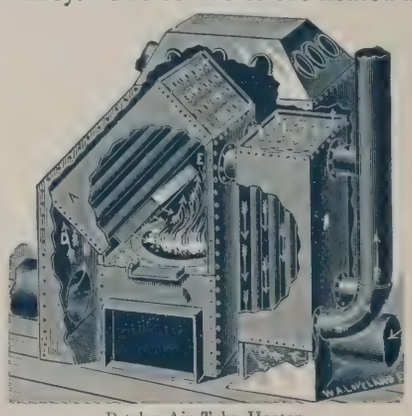


Ridgway Furnace.

per is automatically opened and closed with the feed door, though it can also be operated independently.

PETELER AIR TUBE HEATER.

The construction of this heater will be readily understood from the sectional cut herewith. The fire-box, with grates, cleaning arrangements, and ash pit, is easy of access for cleaning and replenishing the fire. Above the fire pot at an angle of 45 degrees is the drum *A*, made of sheet steel, and provided with a series of tubes through which a continual passage of fresh air is maintained. The tubes are of seamless steel, with the ends expanded into the heads of the drum, as in boiler work, and all joints are reinforced by angle irons thoroughly riveted and cemented, making the drum gas tight. Between the fire pot and the tubes in the drum is a gas burner, consisting of a cast iron retort parallel with the tubes, through which air from the outside is admitted and superheated before it mingles with the gases, thus materially assisting combustion. The drum *B*, similar in construction to drum *A*, is placed at the back of the fire box and separated from it by a gas tight partition. In the upper part of this drum is a direct draft passage, to be used only when starting the fire. The main draft pipes connect the lower part of drum *B* with the smoke pipe, by which arrangement a down draft is secured, so that the greater part of the heat will be extracted from the gases before passing to the chimney. The course of the heated air

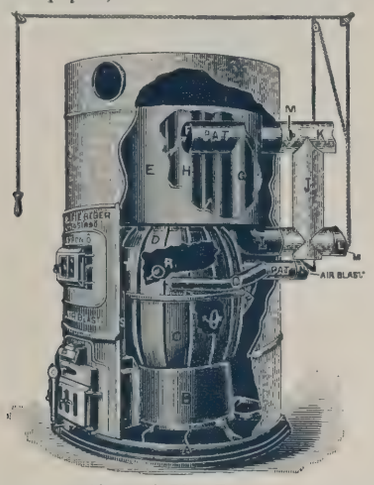


Peteler Air Tube Heater.

and of the gases is shown by the arrows. This heater is manufactured by the Peteler Furnace Co., of Minneapolis.

AKRON AIR BLAST FURNACE.

The peculiar feature of this furnace is that air is supplied for the purposes of combustion not only directly into the fuel but also above the fuel. This is accomplished by means of two pair of blast pipes, the lower ones furnishing

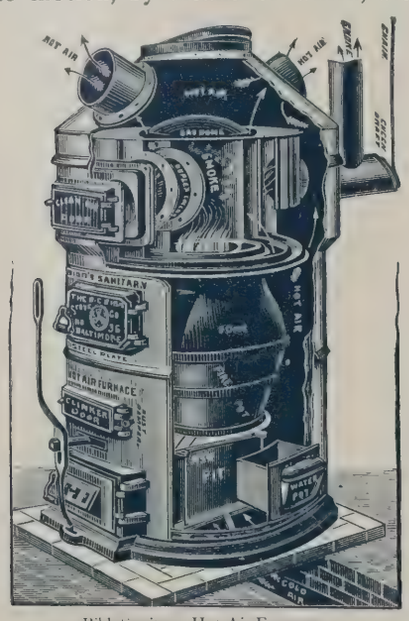


Akron Air Blast Furnace.

sufficient air to liberate the combustible gases from the coals, and the upper ones supplying enough to insure their complete combustion,—both supplies being regulable. Another feature is a central draft, self-cleaning diving flue, which retards the passage of the heated gases from the combustion chamber to the chimney, thus utilizing much of the heat which would otherwise be lost. The furnace is built on the principle of the upright tubular boiler,—the heating surface being greatly increased by subdivision, so that large volumes of air may be heated with the least expenditure of fuel. A regulator on the first floor places the heater under easy control, so that no fuel may be unnecessarily used. The furnace is manufactured by May & Fiebeger, Akron, Ohio.

BIBB SANITARY HOT AIR FURNACE.

This furnace is manufactured by the B. C. Bibb Stove Co., Baltimore, Md., a sectional view being given here. The parts of the grate have an eccentric motion, by means of which, with

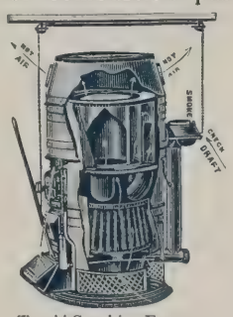


Bibb Sanitary Hot Air Furnace.

little exertion, the fuel may be thoroughly agitated, thus facilitating the free passage of ashes. The grate may be easily tilted forward so as to dump the contents into the ash pit without opening the door. The fire pot is in two sections, surmounted by a dome, the latter being cast in one piece with the feed shoot. All joints are carefully made, the top of each part forming grooves into which the lower edges of the sections above are fitted. The dome or central part of the radiator is practically a continuation of the combustion chamber, forming part of the dome of the fire pot, so insuring almost thorough combustion of the gases before passing to the outer radiator flue, where combustion is completed. The gases are checked in their progress to the flue by means of deflecting plates, having previously given up a great part of their heat to the radiator. The vertical cylinders of the latter are of plate steel. The casings of the furnace, when used in portable form, are made of galvanized iron, in four sections, held in place by cast iron rings. The feed door is provided with a draft regulator, and is lined with a cast iron perforated plate, through which the air is admitted in jets. The furnaces are provided with every modern improvement that can be suggested.

TORRID SUNSHINE FURNACE.

In the portable steel plate furnace shown by the accompanying cut the products of combustion pass upward

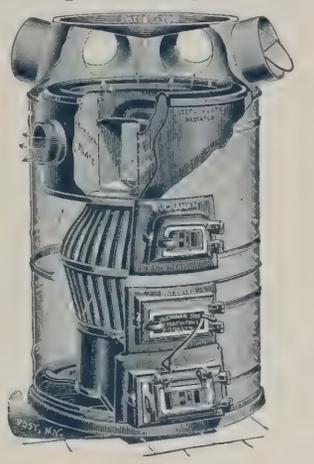


Torrid Sunshine Furnace.

into the inner steel plate radiator, but in order to reach the draft spaces the smoke and gases must descend to the sides of the crab radiator directly above the fire, where the combustion of all unconsumed gases takes place. The crab radiator or draft distributor which connects the fire pot with the heavy steel plate radiators above is cast in one piece thus avoiding joints in that part of the furnace subjected to the most severe heat. One arm of the crab radiator empties directly into the smoke outlet, and is provided with a damper, giving a strong direct draft when starting the fire. The fire pot is either of solid cast iron or of brick lined up inside of a heavy wrought iron shell. It is wider at the bottom than at the top, a construction which prevents the accumulation of dead matter along the sides. The Reading Stove Works (Orr, Painter & Co.), Reading, Pa., are the manufacturers.

BUCHANAN WARM AIR FURNACE.

A. Buchanan's Sons, 1587 Fulton street, Brooklyn, N. Y., manufacture the warm air furnace illustrated herewith in partial section. It is made of heavy and carefully mounted castings, with triple cup joints and perforated gas plate. The radiator is constructed with a division plate, so that the products of combustion make a complete circuit in passing from the combustion chamber to the smoke pipe, giving the largest possible amount of heating surface. The furnace is provided with the Smyth triangular revolving dumping duplex grate, which has three separate surfaces coming into contact with the fire in alternation, dispensing with shaking or sifting of ashes. It



Buchanan Warm Air Furnace.

is claimed for this grate that it does not pack the coal tightly together, allows of free combustion, and prevents the formation of clinkers.

SPRINGFIELD HOT AIR FURNACE.

A valuable feature of this furnace is the smoke-consuming device, by means of which the gases from the fresh coal in the magazine are caused to pass over the glowing coals in the fire pot, which had been previously freed of their volatile parts in the same manner. When the fuel has been thoroughly coked it may be pushed back over the grate and a new supply put in, or it may be left in the magazine unconsumed until required to replenish the supply on the grate. The furnace is so arranged that either hard or soft coal, wood, coke, or natural gas may be successfully burned. The heating surface, as shown in the cut, is vertical aud therefore self-cleaning. Separate feeds are provided for hard and soft coal, so that they may be used either separately or jointly. The furnace is made in five sizes, either for brick setting or galvan-

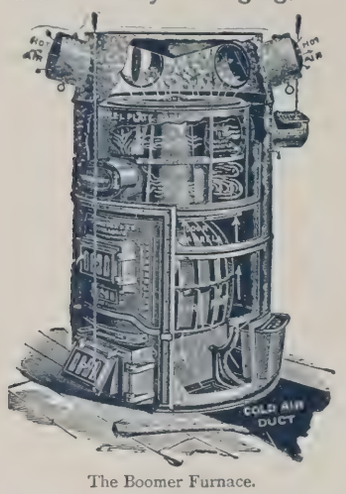


Springfield Hot Air Furnace.

ized iron casing, by L. Patric & Co., 19 West Washington street, Springfield, Ohio.

THE BOOMER FURNACE,

The construction of which is shown in the engraving, is manufactured by Hess, Snyder & Co., of Massillon, Ohio. It has double return flues, steel radiator, and heavy cast iron flanges on the fire bowl and the combustion chamber. It is arranged so that either hard or soft coal may be successfully used as fuel without any changing. When

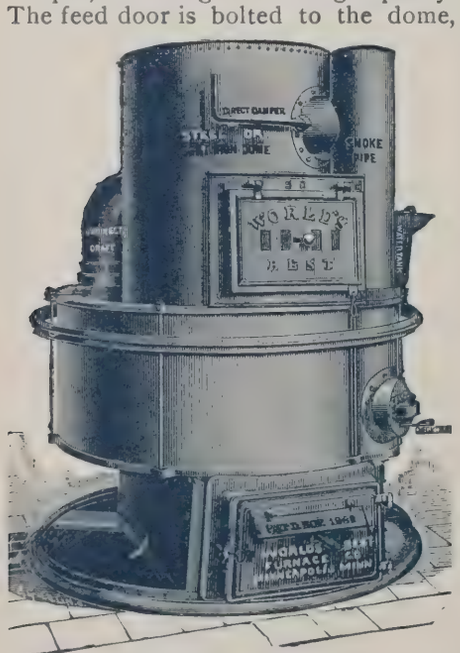


The Boomer Furnace.

soft coal is used the smoke is consumed by a simple device. The furnace is of unusually heavy construction.

THE "WORLD'S BEST" FURNACE

Is manufactured by the World's Best Furnace Co., 14 Washington Avenue North, Minneapolis, Minn. The base is of cast iron, the inner part forming the bottom of the ash pit. The latter is high and roomy, and is provided with a lift-up draw damper and a very large door. The fire pot is cast in one piece, heavily ribbed on the outside, and the grate is of the anti-clinker circular form, pivoted to a cross bar which rests in a ring set below the fire pot. There is ample space between the pipes and fire pot to admit of thorough cleaning. The vapor pan is large, and is intended to be set on top of the radiator. The steel plate dome is the full diameter of the fire pot, and has great heating capacity. The feed door is bolted to the dome,

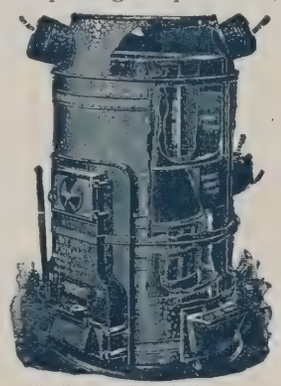


"World's Best" Furnace.

the joint being packed with asbestos. When lifted up, it is held in position by the handle of the direct draft damper, thereby holding the damper open so that there can be no escape of gas. The radiator consists of cast top and bottom rings connected by sheet steel plates, forming a deep flue. The furnace proper is inclosed by a casing in three sections, galvanized iron, asbestos, and tin, the whole fitting tightly to the circular base. Should occasion require it, hot water coils may be inserted in the dome.

THE BEAVER HOT AIR FURNACE

Is manufactured by the Danville Stove & Mfg. Co., of Danville, Pa. It has a large heavy sectional fire pot with protruding flanges and a large crab radiator connecting the heavy steel radiators with the fire chamber. The grates are of the draw center and triplex patterns. The former is concave, mounted on three rollers, and operated by a lever, a few motions of which, with the center slightly drawn, removes the clinkers. The triplex grate is geared and revolves by means of a crank. Both grates are easily operated, durable, and all parts may be changed through the ash-pit door. A large flue connects the ash pit with the exhaust flue, preventing dust or ashes passing to the registers. A large direct draft opening is provided, for use

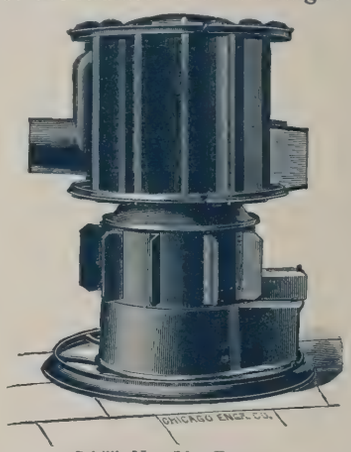


The Beaver Hot Air Furnace.

when starting the fire, or when a quick fire is required. The furnace has very few joints and is claimed to be absolutely gas tight.

SCHILL'S NEW IDEA FURNACE.

The fire pot of this furnace is a double one, consisting of a heavy cast-iron inner pot, with a series of openings near the center and large openings at the top. This inner pot is surrounded by a steel jacket, forming an air heating chamber, into which air is admitted and heated before entering the combustion chamber. Soft coal or screening may be successfully used as fuel, and as soon as the fire becomes covered so that the gases cannot burn through the mass of coal, they pass out of the lower openings in the fire pot, into the air heating chamber, re-entering the fire pot through the large openings at the top and igniting on the top of the mass of fuel. By means of an opening and closing ring between the fire pot and the steel jacket the amount of overdraft can be regulated, so as to take part over-draft and part of draft through grate, or as much at either place as may be desired. The grate is of novel construction and can be readily and quickly replaced. The heating drum consists of an inner and an outer steel plate drum connected by steel wings, the two drums being drawn tightly together and forming air passages, which greatly increases the heating surface. It is constructed so that the entire surface from the bottom of ash pit to the top of the radiator is in a straight line,

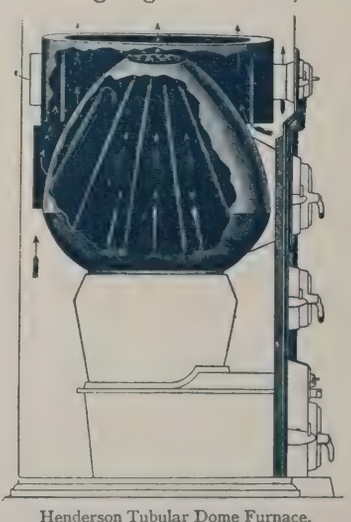


Schill's New Idea Furnace.

with no tubes, crooks, or turns of any kind to prevent the free flow of large volumes of air. Schill Bros., Crestline, O., are the manufacturers.

HENDERSON TUBULAR DOME FURNACE.

The engraving shows this furnace partly in outline and partly in section. The ash pit rests on the front of the base and covers only part of the opening in the base, leaving ample room for the air to rise into the space around the furnace. The grate is hung a little below the top of the ash pit, leaving plenty of space beneath. The fire pot, which is capacious, rests on the ash pit, and above it is a dome or expansion chamber, shaped as shown in the cut. At the rear of the dome is a flue, in front of which is a baffle plate, to retard the passage of the gases from the dome to the flue. Extending from the base to the apex of the dome are twelve three-inch tubes, as shown, expanded into the shell of the dome at each end. These tubes being directly over the fire and in the path of the heated gases, afford valuable heating surface, as there must of necessity be a constant and rapid circulation of air through them. Above the dome is a large annular radiator. The gases from the dome pass entirely around inside of this radiator before going to the flue, the out-

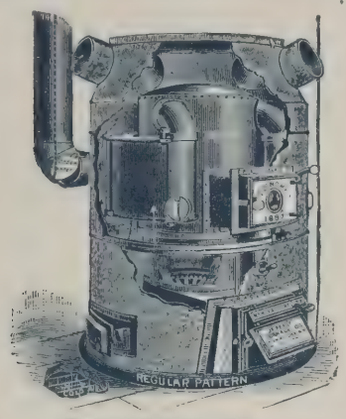


Henderson Tubular Dome Furnace.

side of the radiator thereby adding largely to the heating surface. These furnaces are made by J. C. Henderson, 195 River street, Troy, N. Y.

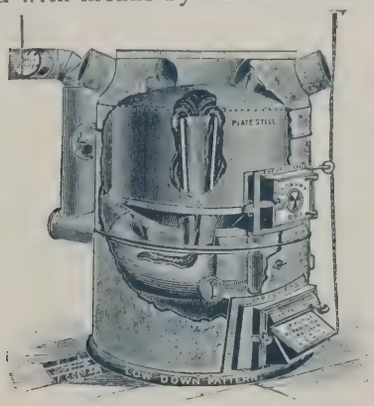
ECONOMY FURNACES.

Fig. 1 shows the regular pattern of steel plate furnace manufactured by the J. F. Pease Furnace Company, Syracuse, N. Y, It is made for burning hard coal, and is portable in



Economy Furnace.—Fig. 1.

form, cased in galvanized iron, with an inside lining of tin and an air space between to prevent waste of heat by external radiation. The combustion chamber is made of selected steel plate, the fire pot, to which it is connected by a cup or grooved joint, being of extra heavy cast iron. The combustion chamber or dome is surrounded by a crescent-shaped plate steel radiator, with which it is connected by iron elbows, through which the products of combustion pass into the radiator, from which they escape through the smoke pipe after giving up all available heat. Fig. 2 shows the company's low-down pattern furnace, which is adapted for burning hard or soft coal or coke. As in the regular pattern, the combustion chamber is of steel plate, but the fire pot, radiator, and all other parts are of extra heavy cast iron connected by cup or groove joints. The combustion chamber has a direct connection with the smoke pipe for direct draft, indirect draft being secured through the connection between the radiator and smoke pipe. In both the furnaces described the escape of dust through the ash-pit door when shaking the grate is prevented by a patent dust pipe, while the radiator may be cleaned through the clean-out flues with which it is provided and through the clean-out door on the indirect draft pipe. These furnaces are fitted with the McClave T anti-clinker grate and with means by which the fire can

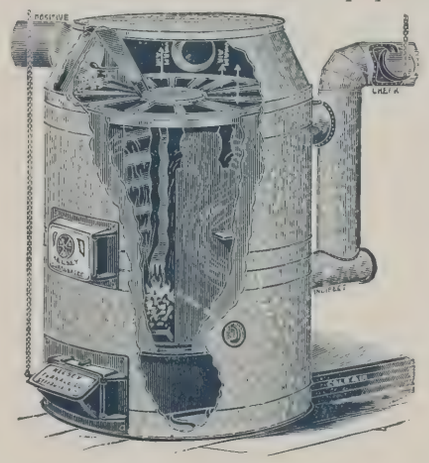


Economy Furnace.—Fig. 2.

be controlled from the rooms above. Great care is taken to make these furnaces perfectly gas tight, so that no impurities find their way into the air chamber. Three other patterns in addition to those described are made by the manufacturers.

THE KELSEY CORRUGATED FURNACE.

The fire pot of this furnace is composed of a number of nearly V-shaped sections, cast hollow, and with corrugated sides, through which the fresh air admitted to the furnace is conducted. Each of these hollow sections is 36 inches long, all together having an opening at the lower end of 37 square inches. These sections are all interchangeable, and each has a little over 8 square feet of fire or radiating surface. By capping two or more of the upright hollow sections forming the fire pot all the heat produced by such sections can positively be directed to that portion of a building most difficult to heat. A heavy inside steel casing envelops all the castings of the furnace except the ash pit, a 3-inch air space between the backs of the upright hollow sections and this inside steel casing forming the draft chamber of the furnace. The outside galvanized casing is 3 inches from the inside steel casing. The furnace is fitted with the popular

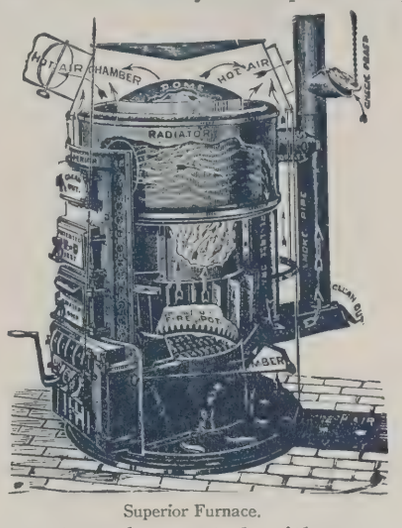


Kelsey Corrugated Furnece.

Smythe triangular revolving duplex grate, and is manufactured by the Kelsey Furnace Co., Syracuse, N. Y., whose New York agent is Mr. L. V. Sanford, with offices at 113 Beekman street.

THE SUPERIOR HOT AIR FURNACE.

The Superior steel furnaces are constructed with side flanged fire pots cast in two sections, and a Bessemer steel plate dome, with boiler riveted joints carried up the full diameter of the fire pot. From the large combustion chamber thus afforded, the burning gases pass through a large opening in front into the steel plate radiator and completely around to the smoke exit in the rear, giving a very large radiating surface. A direct draft is provided for use when starting the fire or burning wood or coke, and an indirect or reverse draft when burning hard coal. A positive dust escape is provided from the ash pit direct to the smoke pipe, so that the dust is not compelled to pass through the combustion chamber. Check drafts are arranged to govern the furnace and regulate the temperature without going to the cellar. Superior furnaces are manufactured under U. S. patents in six styles and twenty sizes adapted to all climates and for all fuels. Each furnace is fitted with the Smythe duplex dump-

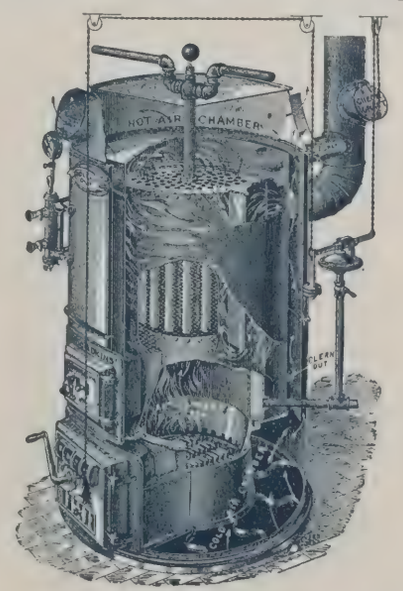


Superior Furnace.

ing grate and mounted with an ornamental solid shield cast front. The Superior Furnace Co., Little Falls, N. Y., are the manufacturers.

THE ADKINS COMBINATION HEATER.

The Adkins steam and warm air combination heater was developed and perfected by Mr. E. V. Adkins, who has had long experience as a heating engineer. It has the same general appearance as the Superior furnace described elsewhere, but has a vertical tubular water-leg boiler forming a part of the fire pot and encased by a steel dome, as shown in the cut. The boiler shell is of quarter-inch wrought iron, the crown sheet and head being five-sixteenths thick. The burning gases pass up through all the boiler tubes into the combustion chamber, thence down in front of the boiler to the water leg, and up at the rear to the exit. This course of the gases is caused by a diaphragm or baffle plate covering the rear half of the combustion chamber, and division plates between the boiler and dome. The water connections are shown in the cut. The castings are manufactured by the Superior Furnace Co., while E. V. Adkins' Sons, 235 Lake street, Chicago,

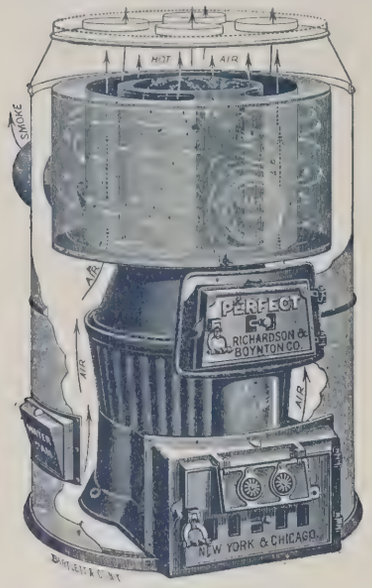


Adkins Combination Heater.

are the selling agents. All communications concerning this heater should be addressed to them.

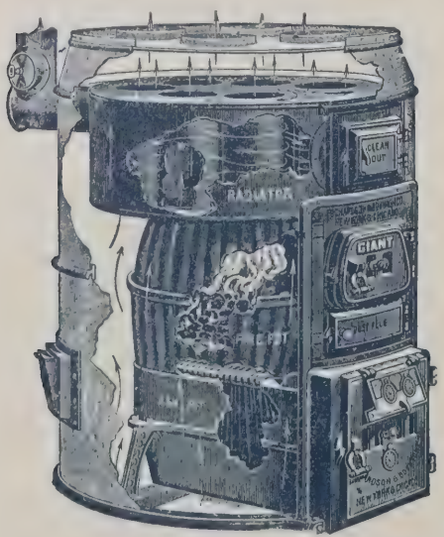
PERFECT AND GIANT FURNACES.

The accompanying cut, Fig. 1, shows the 1894 pattern of the Perfect furnace, with a new form of high gas burning combustion chamber and



Perfect Furnace.—Fig. 1.

steel reversible flue-heating radiator, which is readily accessible and easily cleaned without removing any part of the furnace. The products of combustion rise to the center of the radiator, circulate freely, and then revert, passing to the front and then back through both side smoke flues of the radiator, giving an extra large and effective heat-producing surface. All Perfect furnaces (other well-known styles of which are not presented here for lack of space) are fitted with the Perfect triangular revolving anti-clinker grates, which are simple in construction and easily operated. The Giant furnace, with heavy wrought steel radiator, is shown in Fig. 2. This furnace is made in portable and brick-set form, as are also the Perfect furnaces just described. It is made in nine sizes, with fire pots from $15\frac{3}{4}$ to 36 inches in diameter, the outer casings being from 24 to 60 inches in diameter. Four sizes are built for erection in low cellars, reducing the height five inches, and sectional fire pots are supplied with some sizes

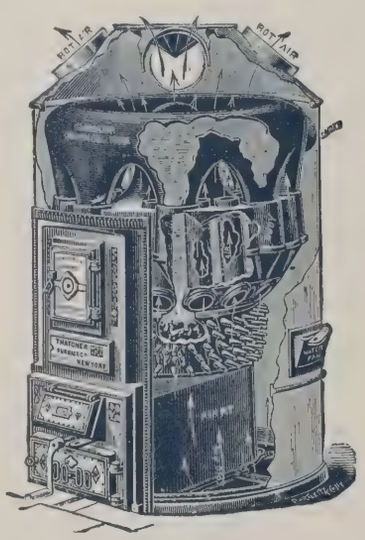


Giant Furnace.—Fig. 2.

when ordered. The Richardson & Boynton Co., 232–234 Water street, New York, are the manufacturers.

THATCHER TUBULAR FURNACE AND COMBINATION HEATER.

In this furnace a number of pins or fingers about three inches long, which are cast on the outside of the one-piece fire pot, serve to increase the radiating surface, and to break up currents of incoming cold fresh air, thus insuring quick heating. The cumbustion chamber, resting on the fire pot, is cone shaped at the bottom to prevent the accumulation of ashes. Passing through the combustion chamber around the sides is a series of cast iron gas-tight tubes, through which a large amount of the fresh air passes. The products of combustion are obliged to pass around this tubular surface before they can escape to the upper radiating ring, thus heating the air passing through the tubes in addition to that passing over and around the combustion chamber and upper radiator or smoke-ring, which is cast in one piece and is gas-tight and self-cleaning. It is also adjustable, so that the smoke pipe can be attached from any direction, and is so arranged that the smoke and gases must go around the ring before leaving the furnace. The furnace is provided with

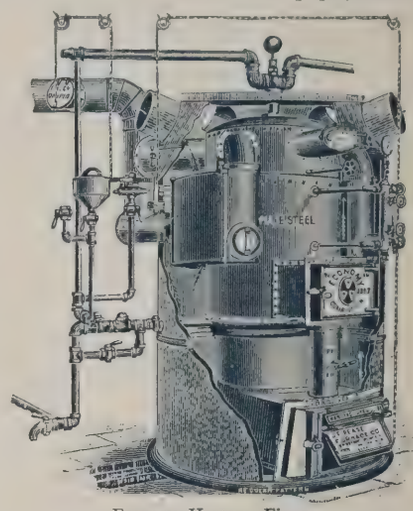


Thatcher Furnace.

a simple revolving anti-clinker grate, and is put together with asbestos cement, connections being made by cup joints. The construction of the Thatcher combination heater is the same as that of the furnace with the exception that a simple water ring and boiler are added. The Thatcher Furnace Co, 240 Water street, New York, are the manufacturers.

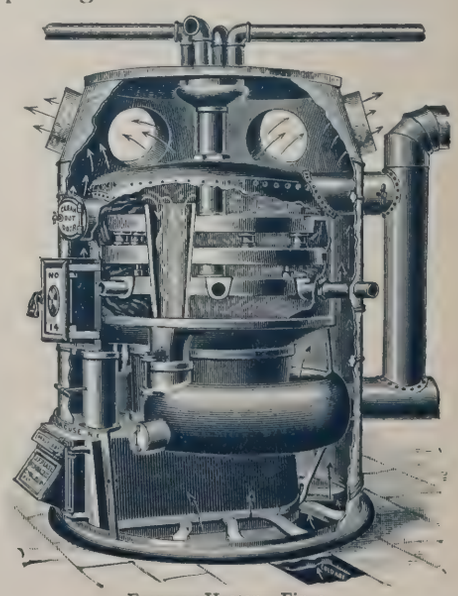
ECONOMY COMBINATION HEATERS.

The regular pattern of steam and warm air combination heater manufactured by the J. F. Pease Furnace Co., Syracuse, N. Y., is shown in Fig. 1. It is made for burning hard coal, and is portable in form. The bottom ring, ash pit, dust-pipe, and fire pot are of cast iron, the combustion chamber and the crescent shaped radiator which surrounds it, and with which it is connected by iron elbows, being of heavy steel plate. The boiler is constructed of selected plate steel, with 2-inch standard tubes. The bottom of the boiler inclines from the front to the rear, the return pipe entering at the lowest point to facilitate pressure cleaning. Although suspended directly over the fire, it does not impair the draft, and its whole surface is efficient in generating steam. A direct draft pipe connects the dome or combustion with the smoke pipe, which



Economy Heater.—Fig. 1.

is connected by an indirect draft pipe to the radiator. The products of combustion after passing up through the flues and around the sides of the boiler, enter the radiator, from which they pass into the chimney after giving up all their available heat. The company's low-down pattern water and air combination heater, shown by Fig. 2, is built with special reference to durability, economical maintenance, and effective simplicity. It is provided with a direct and indirect draft, and is invariably set in portable form, cased in galvanized iron, with an inside lining of tin, with an air space between to prevent the external radiation of heat in the cellar. In operation, the air, coming in through the cold air chamber, circulates over a large area of heating surface, the cast iron pot, air radiator, and the steel combustion chamber, and is distributed to the registers. The water, entering the lower of the three water sections through the return inlets, finds a positive and continuous circulation through the sections. After passing several times over the fire at

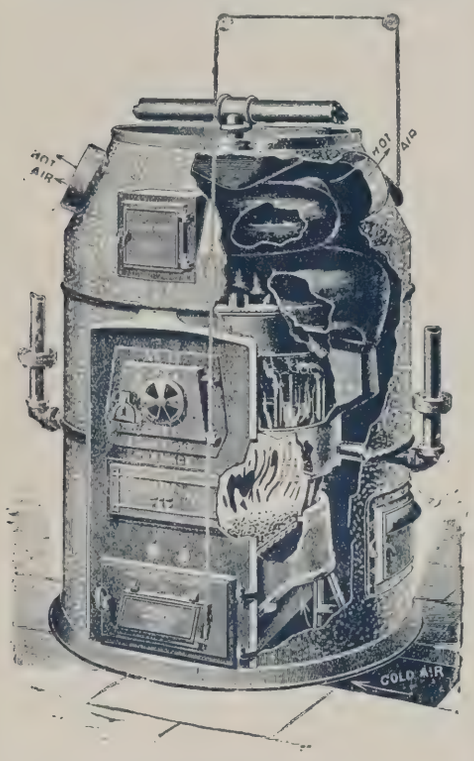


Economy Heater.—Fig. 2.

its highest temperature, the water flows through the mains to the radiators, and returns to the inlet.

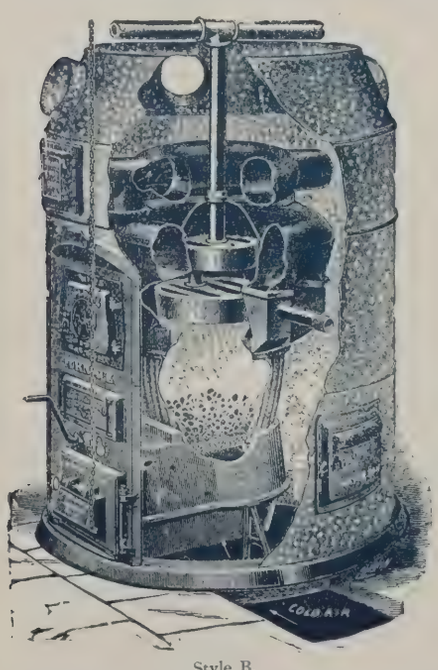
FLORAL CITY COMBINATION HEATER.

Two styles of these furnaces are made by the Monroe Foundry & Furnace Co. of Monroe, Mich. With the exception of the boilers, both are practically the same, being heavy all cast furnaces with double radiators and without bolted or cemented joints. In style *A* the fire pot is in two sections, the upper part being hollow and forming the lower water ring or boiler. Seven pipes lead from this to the upper ring or water dome, which is directly over the fire in the center of the combustion chamber. The flow pipe leads from the upper ring, as shown, and the returns enter the lower ring at each



Style A.

side. Both rings are cast in one piece. The air and water heating capacities are nearly equal, though the latter may readily be reduced any desired amount. In style *B* the water heating

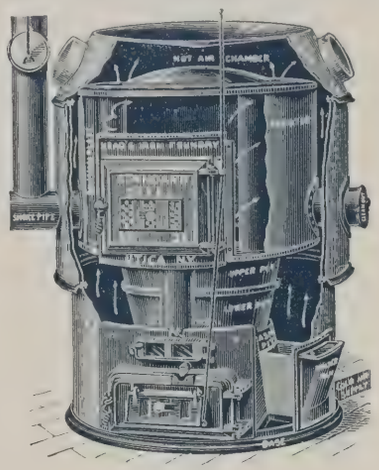


Style B.

capacity is about a third that of the air. The two gridiron shaped boilers are placed directly over the fire in the combustion chamber, the returns entering the lower one at the side and the flow passing out at the top from the upper one, both being connected by a short nipple. The proportionate water heating capacity of this surface may also be reduced.

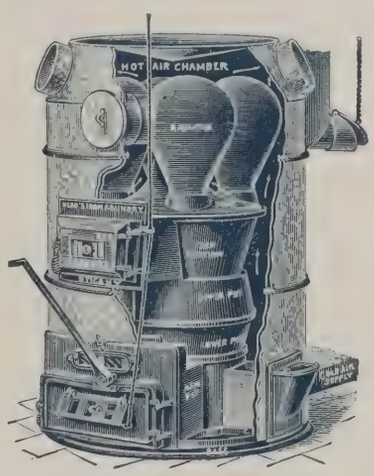
THE STANDARD FURNACES.

The construction of the Standard steel furnace is shown in Fig. 1. The



Standard.—Fig. 1.

cast iron part of the furnace is made heavy, strong, and durable, while the steel used in the radiator is of first quality of heater drum cold-rolled steel. The course of draft is to the front and completely around the radiator to the smoke outlet at the bottom of the radiator on the opposite side. The division plate is adjustable, and can be placed either to the left or right of feed

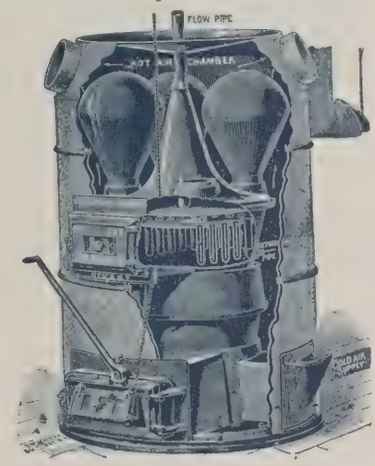


Standard.—Fig. 2.

door, and the collars on the radiator can be placed either for smoke outlet or clean-out, according to the position of the division plate. Fig. 2 shows the Standard air blast furnace, which is designed for burning soft coal and thoroughly consume the dense smoke and soot arising from its use. Enough air is mixed with the gases arising from the fuel to insure the perfect combustion of the coal, which burns with a bright red flame, leaving no unpleasant odor or dirt. The perfect working of these furnaces as well as of their other styles is guaranteed by the manufacturers, Giblin & Co., Utica, N. Y. The company's hot water combination heater is shown by Fig. 3. It is made by applying to the Standard air blast furnace a hot water attachment consisting of a reservoir into which are screwed a number of 1-inch drop tubes, each six inches long, welded at the lower ends with a central diaphragm in each to promote circulation. The manufacturers state that this is the only combination heater made in which the fire surface can be increased or diminished to meet the requirements and evenly balance the system after the heater is set up. If the amount of space to be heated by hot water is small, or if the fire surface be found to be too large, some of the drop tubes may be removed, iron plugs being screwed into the tube openings, and only as many need be used as will best do the required heating.

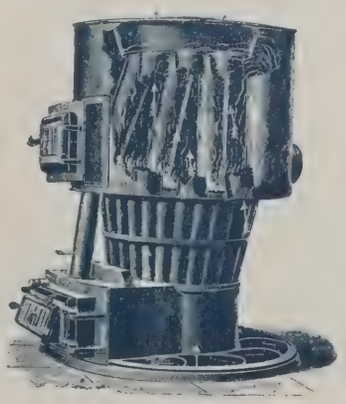
THE FOX FURNACE.

The radiator of this furnace is made of steel plate and has a series of heavy cast iron air ducts or tubes running from the outside of the bottom to the center at the top, passing the air to be heated directly over the center of the fire pot and the hottest portion of the fire. In



Standard.—Fig. 2.

addition to the interior tube radiation there is that of the usual outside radiator surfaces, so that the air is rapidly warmed. The return flue is placed at the rear of the radiator, and by it the products of combustion are forced to travel over each air tube to the top, and then to the bottom of the radiator before entering the smoke flue, thus extracting all available heat. The fire pot is made in two sections, which are corrugated to allow for expansion and contraction. The dust flue connects the ash pit and combustion chamber above, so that all dust from shaking is conveyed by natural draft into the smoke flue. The furnace is equipped with the Smyth triangular bar grate, which obviates the use of a poker for the removal of ashes, and is manufactured by the Fox Furnace Co., 28



Fox Furnace.

Vincent street, Cleveland, O. It is adapted for burning hard or soft coal, coke, wood, or gas.

CARTON FURNACES AND COMBINATION HEATER.

The construction of the Carton low gas-tight furnace shown in Fig. 1 is such as to present a very large radiating surface, the combustion chamber, flues, and feed sections, from which radiation takes place, representing two-thirds of the furnace. The flues being placed on the extreme edge of the radiators, as shown, draw the products of combustion from the gas dome into the combustion chamber, from which they pass through the flues into the upper radiator, thus compelling them to pass over the entire radiating surface before reaching the chimney. The manufacturers state that the radiating flues, on account of their form, size, and number,

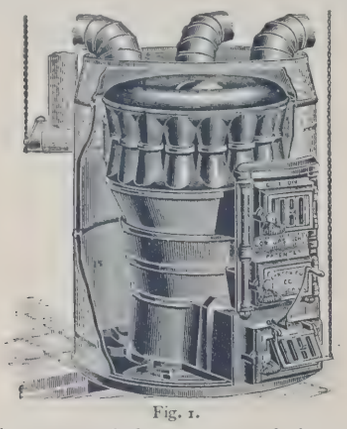


Fig. 1.

tend to retard the escape of the gases, while their close proximity to each other reduces the metal at the point where they enter the upper radiator to a mere edge on which no soot or dust can lodge, in consequence of which, there being no horizontal joints or projections, the flues, radiators, and gas domes are self cleaning. The fire pot is made in two heavy pieces of cast iron, the division or cup joint being exactly in the center, so as to obviate the liability of the pot to break or crack by its expansion and contraction, and to do away with ribs, flanges, wings, or other projections. It is stated that a large portion of the air is drawn through the opening between the radiating flues and over the gas dome by creating a partial vacuum between the gas dome and the top radiator, thus compelling it to take up a large amount of heat. Fig. 2 shows the Carton Junior furnace, with extra heavy cast-iron radiator, which is made for burning soft coal. The radiator may be

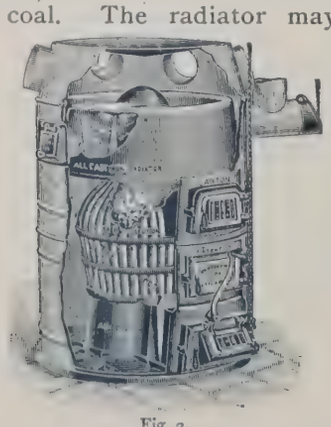


Fig. 2.

so adjusted that the smoke pipe can be carried out at any angle to the furnace, the surface of the radiator being brought into as close contact with the fire as possible and still secure perfect combustion, the greatest possible amount of heat, and the most even temper-

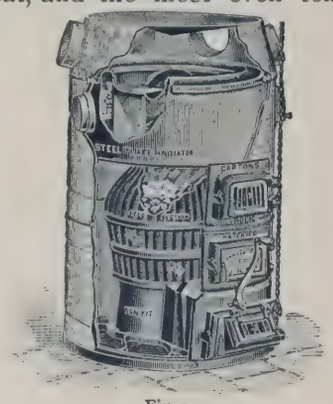


Fig. 3.

ature at slow combustion. Fig. 3 shows Carton's Tropic furnace for hard coal, with return flue steel radiator, in which the products of combustion are compelled to make a complete circuit, thereby getting the full benefit from the fuel. Fig. 4 shows the construction of the Carton low gas-tight combination heater in such a manner that a detailed description is unnecessary. It is designed for use with either hard or soft coal. The hot water attachment is made up of one-piece castings, the fire pot, water ring, and the hot water dome being connected by wrought iron pipe, as

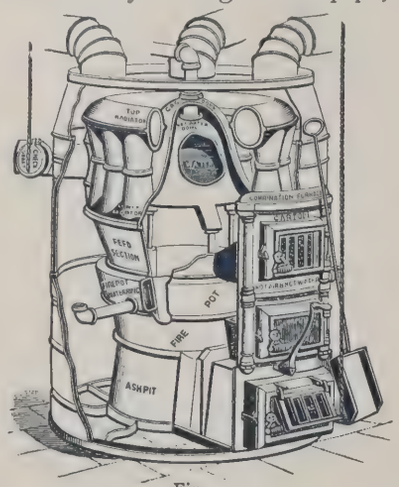


Fig. 4.

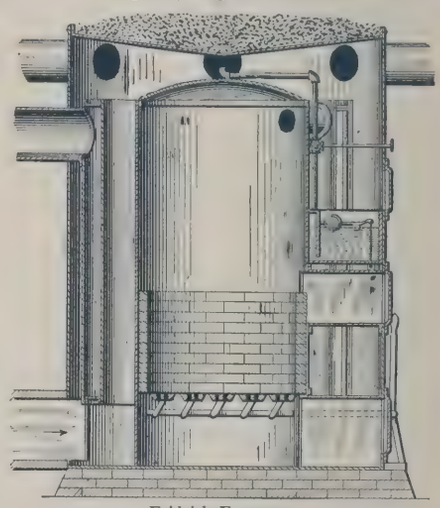
shown. All the furnaces and combination heaters made by the manufacturers, the Carton Furnace Co., Utica, N. Y., are fitted with the well-known Smythe triangular revolving duplex grate, which is easily operated and kept clean.

FRIDRICH'S HOT AIR FURNACE.

The strong points of this furnace, as presented by the inventor (Mr. George W. Fridrich, St. Louis, Mo.) are the very large heating surface, and an automatic apparatus for regulating the amount of water in the air moistening device, together with improved means for distributing the vapor in the warm air chamber of the furnace. The lower part of the combustion chamber is lined with fire brick, forming the fire pot. Between the combustion chamber and the outer casing is an annular radiator, broken away in front to give space for the fire door and the air moistening device From the top of the combustion chamber the gases pass through two flues to the front of the radiator, through which they are distributed from top to bottom by a series of vertical deflecting plates, passing thence from the bottom at the rear upward to the smoke pipe. The moistening device consists of a small rectangular boiler over the fuel passage, heated by the combustion chamber, the water in which is kept at a uniform level by a float and valve, the steam outlet being in the hot air chamber above the combustion dome.

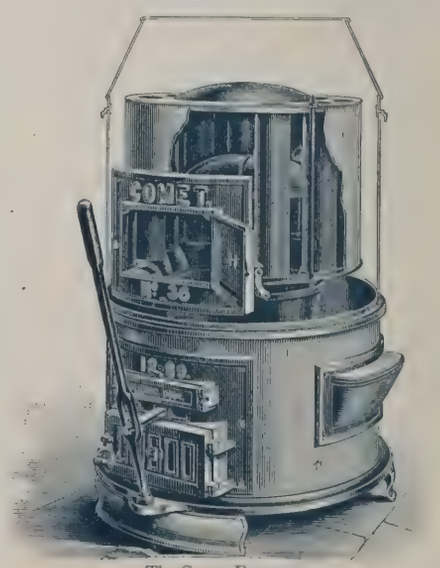
THE COMET FURNACE.

The dome of the furnace shown by the accompanying cut is made of



Fridrich Furnace.

heavy wrought steel with a series of 3½-inch steel air tubes inside and surrounding the fire-pot. From the top of the fire door to the bottom of the smoke collar on the opposite side of the furnace is a diaphragm which rests against all of the tubes and forces the products of combustion around the air tubes and against the shell of the dome before their exit to the chimney, so that air is heated both inside and outside of the dome. The draw center grate used is mounted on three 3-inch pinion wheels so attached to the sides of the ash pit that they can readily be replaced, shaking being accomplished by a lever attached to the end of the shaking bar, which extends outward through the front of the

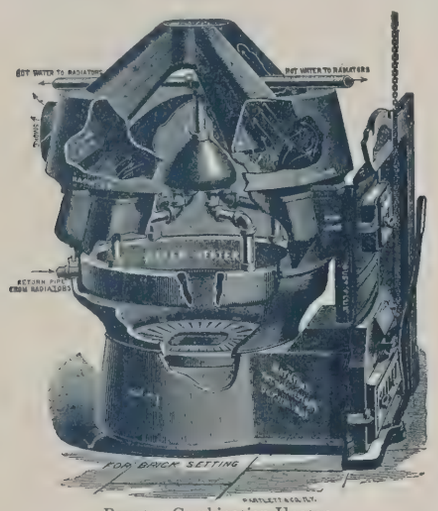


The Comet Furnace.

furnace as shown. The J. L. Mott Iron Works, 84–90 Beekman street, New York, are the manufacturers.

THE BOYNTON COMBINATION HEATER

Is made in portable and brick set forms in sizes whose hot air heating capacity varies from 15,000 to 26,000 cubic feet, the hot water heating capacity in addition to hot air varying from 10,000 to 18,000 cubic feet, the number of square feet of direct radiating surface, including flow and return mains, being from 350 to 600 square feet. The heater is constructed with either patent triangular revolving grates or antifriction draw center grate as may be desired. The aim of the manufacturers, the Boynton Furnace Co., 207–211 Water street, New York, has been to arrange the hot water attachment of the heater

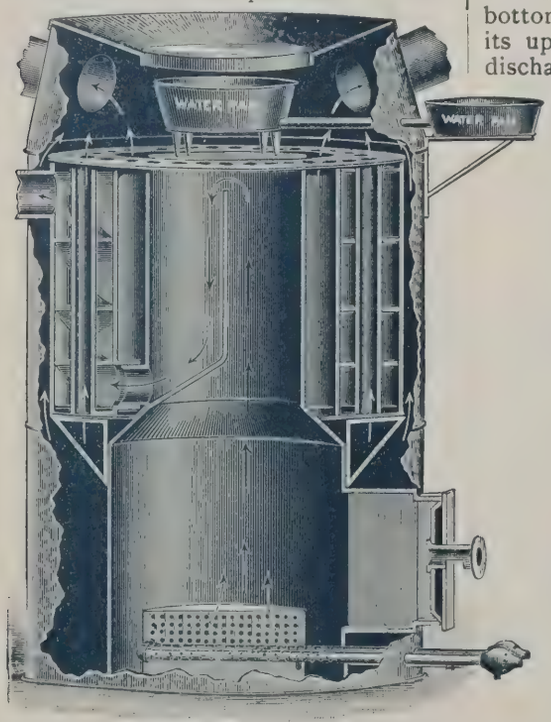


Boynton Combination Heater.

so as to utilize the largest possible portion of the fuel consumed without in any way decreasing the efficiency of the furnace as a hot air generator. The hot water generator or heater is made of cast iron, as are the other parts of the furnace.

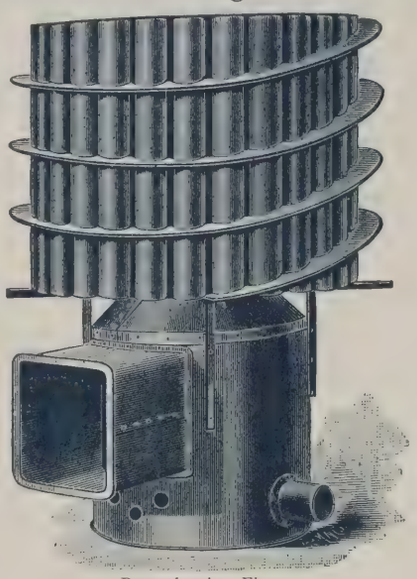
PENNSYLVANIA GAS FURNACE.

In this furnace gas is used as a fuel, air being admitted to the burners through a perforated shield over the top of the burners, thus causing an even intense heat. The products of com-



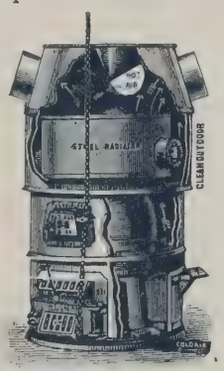
Pennsylvania.—Fig. 1.

bustion pass from the fire chamber into the radiating drum, which entirely surrounds the fire chamber. Between the outer and inner casing of this drum is placed a partition, which forms a flue and causes the products of combustion to pass four times around the drum before reaching the exit. Be-



Pennsylvania.—Fig. 2.

sides the large heating surface of the outer and inner casing or sides of the drum a series of tubes extend through both the top and bottom heads of the

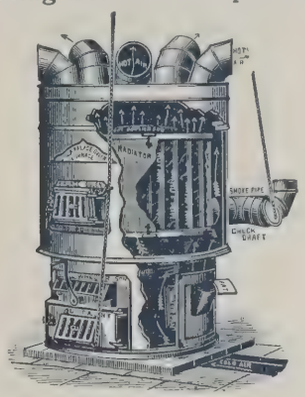


Palace King Furnace.

drum and through the partition forming the winding flue, as shown in Figs. 1 and 2. The cold air entering the bottom end of these flues is heated in its upward passage through them and discharged into the dome of the furnace. A finely perforated double pipe burner isused, and an evaporating pan connected to an outside reservoir is placed on the fire chamber to moisten the air distributed to the various rooms to be heated. Besides cleanliness, one of the advantages claimed for a furnace of this kind is the quickness with which heat may be generated. The Pennsylvania Gas Furnace Co., 77 W. Chippewa street, Buffalo, N. Y., and Warren, Pa., are the manufacturers.

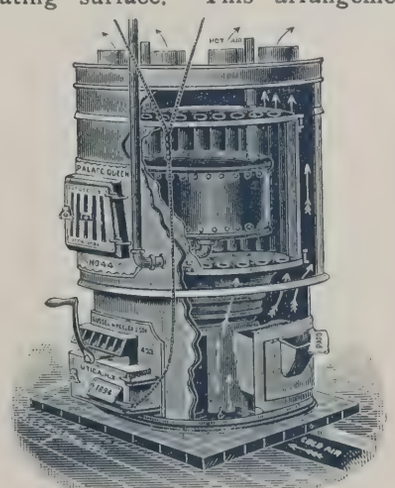
PALACE KING, QUEEN, AND COMBINATION FURNACES.

These three furnaces are made by Russel Wheeler & Son, Utica, N. Y. The first named is made for either portable or brick setting, and for either hard or soft coal, the latter having a cast iron radiator; that for the hard coal furnace being made of heavy sheet steel. The joints are few, all being of the sand cup style, and gas tight. The ash pit is capacious, its door being large enough to remove and replace the grate. The grate is anti-clinker, and both shakes and dumps. The fire-pot is in three sections, and the evaporating pan is large and easily replenished. The dome is large at the base and contracted above, and the enlarged gas chamber of the radiator admits of expansion and complete combustion of the gases, which make a complete circuit of the radiator. The Palace Queen differs from the foregoing only in its construction above the fire-pot. Projecting from the upper edge of the latter is a large radiator of sheet steel, within which is a row of boiler tubes. These are placed close together at the rear, being set farther apart as they



Palace Queen Furnace.

approach the front. The space between the tubes and the casing forms a flue, so that the heated gases pass in through the spaces between the tubes, in proportion to the size of the opening, and around to the smoke exit at the rear, thus imparting their heat to the tubes and casing, and through these to the air supply of the furnace. The feed door is large, while the escape of gas is prevented by an automatic swinging smoke curtain. As it is sometimes desirable to use hot water in combination with hot air in heating some buildings, the manufacturers have introduced the Combination Palace Queen, in which a wrought iron boiler, suspended in the fire-pot, is provided with a large number of boiler tubes, through which the products of combustion pass on their way to the chimney. The outside of the boiler is also in contact with the fire, so that all parts of it are effective heating surface. This arrangement

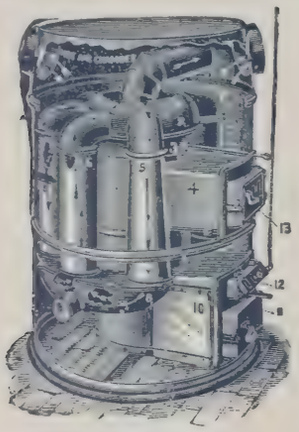


Combination Palace Queen.

does not interfere materially with the air heating capacity of the furnace, so that the combination is very effective.

PATTERSON WARM AIR FURNACE.

In the furnace shown in the accompanying illustration, the smoke and gas, after leaving the radiating chamber, travel through a series of outer radiating flues, in the course indicated by the arrows, before reaching the central common flue. The cool air coming in contact with the large flues absorbs the heat of the products of combustion, and the manufacturer claims that the temperature of the smoke pipe can be so reduced, without impairing the draft, that it can be handled with safety six feet from the furnace. The furnace is

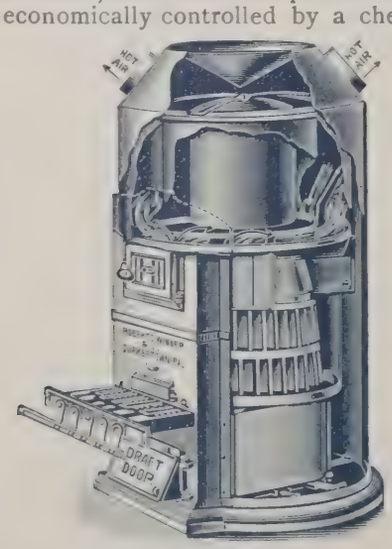


Patterson Furnace.

compact, with large radiating surface, heavy cast iron fire pot, large ash-pit and anti-clinker grate. It is manufactured by J. E. Patterson, Erie, Pa.

ALASKA FURNACE.

The furnace shown in the sectional cut presented herewith is manufactured at Quakertown, Bucks County, Pa., by Roberts, Winner & Co. The fire pot is made in two parts, with sand joints, and the crab is constructed in such a manner that all the heat and gases are forced to the outer drum, thus giving a large heating surface. The crab has a direct draft arrangement, and the dust flue is located in the front of the furnace, insuring cleanliness and convenience. The furnace is provided with rocking grates so arranged that they may readily be removed without disturbing any other part of the furnace. The ash-pit is extra large, insuring a good draft, and the consumption of fuel is economically controlled by a check

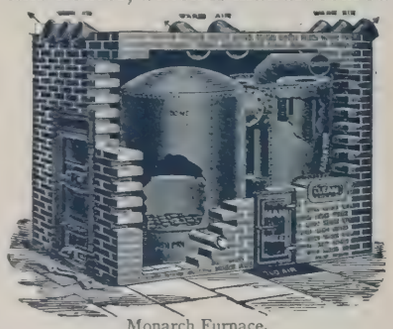


Alaska Furnace.

damper placed back of the smoke collar and opening inwardly. The furnace is made for any kind of fuel.

MONARCH ANNEALED STEEL WARM-AIR FURNACE.

The engraving shows the construction of this heater, which is manufactured by

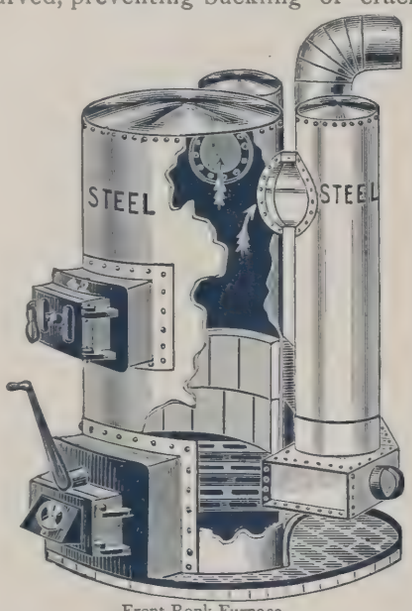


Monarch Furnace.

Kruse & Dewenter of Indianapolis, Ind. It is constructed of riveted annealed steel plates, the combustion chamber being lined with fire-clay tile. The grate is of the rotating type, and check drafts are so arranged that they may be operated from a room upstairs without the necessity of going to the furnace. It has a reversible flue radiator, and burns anthracite or bituminous coal, coke, wood, or natural gas.

THE "FRONT RANK" FURNACE

Is constructed almost entirely of wrought steel, closely riveted and gas tight. All the heating surfaces are curved, preventing buckling or crack-

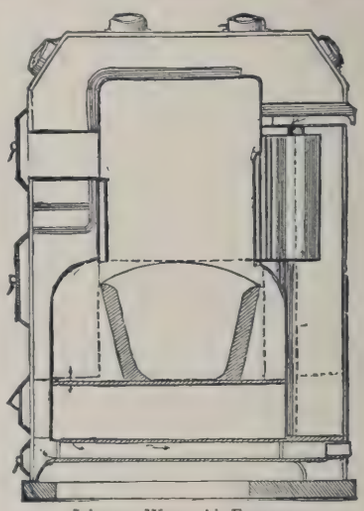


Front Rank Furnace.

ing; and the fire pot is lined with sectional fire brick in a self-supporting circle, so that they cannot become loose or fall out. The radiating surface is large in proportion to the grate surface, and the products of combustion pass slowly from the combustion chamber down two large radiators at the rear, then through the dust-chamber or independent flue, and up through the smoke pipe. The two descending flues are much larger than the one ascending flue, so as to retard the heat descending through them and to increase the radiating surface. The combustion chamber is situated eccentrically within the hot air chamber, and the dust chamber is at the opposite side, directly above the cold air inlet, so that the entering air begins to take up heat at the farthest point from the hottest part of the furnace. It is manufactured by the Front Rank Steel Furnace Co., 713–715 N. Main street, St. Louis, Mo.

JOHNSTON WARM-AIR FURNACE.

The aim in the construction of the heater shown in the accompanying cut has been to produce a furnace for the economical combustion of soft coal. It is made with a large heating surface, and is encased in a shell of sheet metal. For the purpose of securing perfect combustion a series of air induction passages extend inward from the casing of the furnace, passing through the air warming chamber and upward on the outside of the combustion chamber, where they discharge currents of heated air, which passes into the furnace

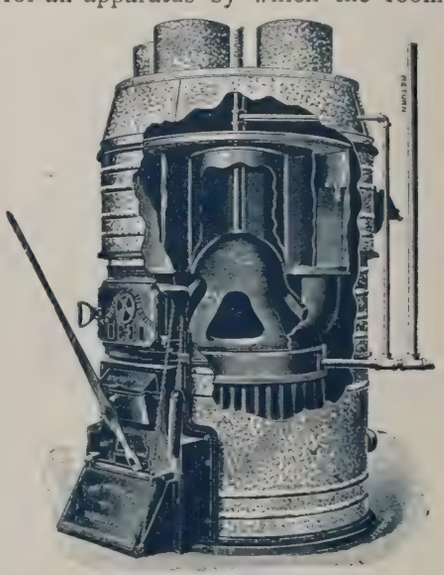


Johnston Warm-Air Furnace.

through holes just above the fire pot. Geo. W. Johnston, Farmington, Ill., is the patentee and manufacturer.

READING COMBINATION HEATER.

The accompanying cut shows a new combination heater recently brought out by the Reading Stove Works (Orr, Painter & Co.) of Reading, Pa. The water ways in the water section are so arranged that there is a constant upward movement of the water from the lower ring to the flow pipe. The water section is cast in one piece and has a large radiating surface, part of which is directly in contact with the burning fuel, the remainder being located directly over the fire. This heater is intended to meet the increasing demand for an apparatus by which the rooms

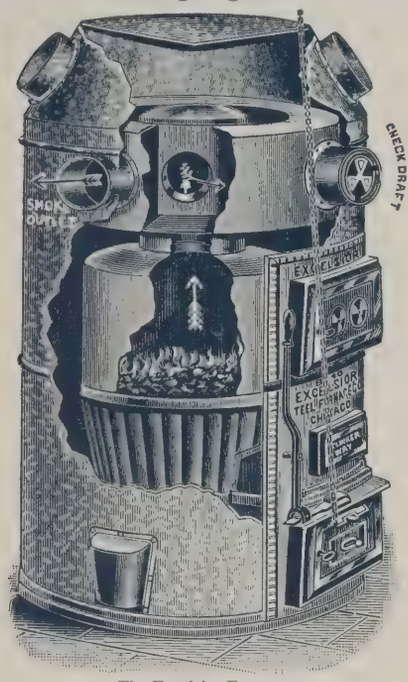


Reading Combination Heater.

near the furnace can be heated by hot air and the more distant rooms by means of hot water radiators.

THE EXCELSIOR STEEL FURNACE

Is made by the Excelsior Steel Furnace Co., 38 and 40 West Monroe street, Chicago. The cast-iron fire pot is surmounted by a flange steel dome, on top of which is a smoke radiator with a 14-inch steel cylinder. The radaitor is indirect, the smoke passing entirely around it before going to the chimney.

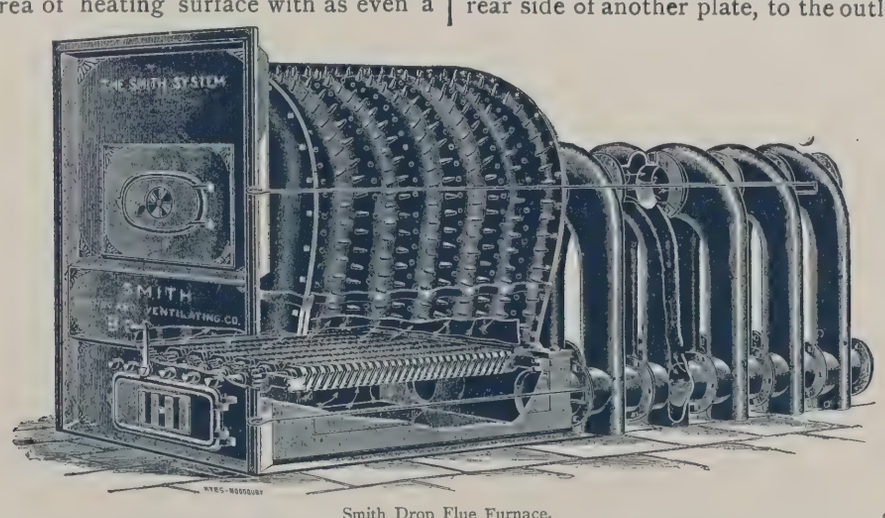


The Excelsior Furnace.

The furnace is supplied with a damper regulator and a shaking apparatus, both of which are shown in the accompanying sectional view of the "B" pattern furnace, which has been selected for illustration from among six different patterns as being a fair representation of the line manufactured by the company, their claims being briefly that it combines simplicity and ease of regulation with durability and economy of fuel. The grate is duplex, and the clinkers may be removed without shaking the grate. Both parts of the latter are moved by one operation, and the contents may be dumped by means of a slide at the center.

THE SMITH DROP FLUE FURNACE.

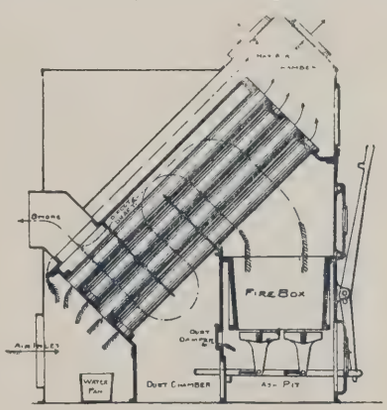
The accompanying illustration shows one of a new type of horizontal furnaces in which the object of the designer has been to secure the necessary area of heating surface with as even a distribution of the heated gases as possible, and at the same time to avoid a complicated construction either as to joints or flue spaces. Above the fire box the heating surface is extended by corrugations and pins, and all the flues are easy of access for cleaning from the front of the furnace. At starting the draft is direct, but when the fires are well kindled all gases must descend to the bottom of the rear heating surfaces before escape to the smoke stack is possible. The furnace is made for ventilation contracts, its weight and cost barring it from competition where mere warming is required. When set up it is about 6 feet high by 4 feet broad, and from 7 to 14 feet in length. The fire box is about 3 feet square, and the weight of iron used is from three to four and one-half tons. The Smith Heating and Ventilating Co., 53 State street, Boston, are the manufacturers.



Smith Drop Flue Furnace.

THE KENT AIR HEATING FURNACE

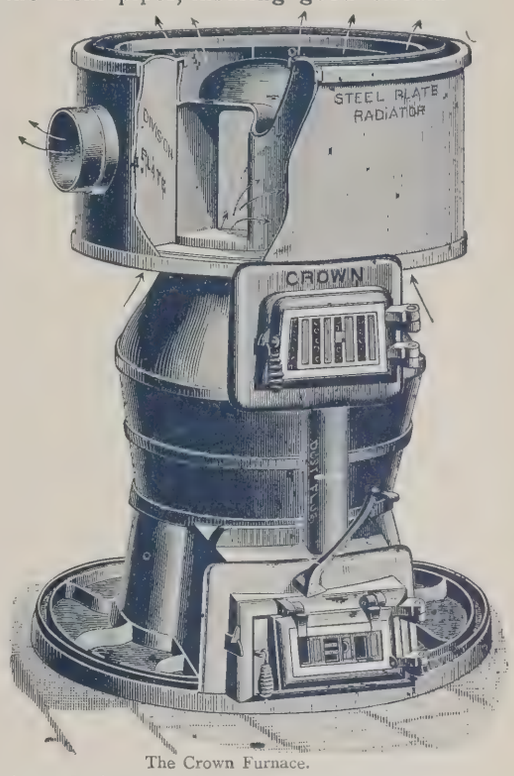
Shown in the sectional engraving herewith is provided with a large combustion chamber, and ample provision is made for utilizing all the heated gases developed by combustion. The air heating portion of the apparatus consists of an inlet and outlet chamber connected by inclined tubes which are inserted in tapering collars in the inlet chamber, and are free to move lengthwise, so that each tube may expand and contract longitudinally, without strain, and are packed with asbestos to prevent air or gas leaks. The direction of the flow of the heated gases is controlled by a partition or baffle plate, and is normally over the baffle plate downward between and around the tubes, thence upward on the rear side of another plate, to the outlet. This furnace is especially adapted for use in buildings where the fan system of ventilation is required, and is for sale by the inventor, Robert S. Kent, 11 South Ninth street, Philadelphia, Pa.



Kent Furnace.

THE CROWN FURNACE.

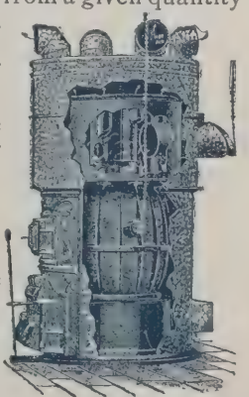
This furnace, shown partly in section in the cut, is made by the March-Brownback Stove Co., of Pottstown, Pa. It stands low, thus making it suitable for low cellars, giving good elevation to the heat pipes, insuring good circulation. It is provided with a triplex grate (Smythe patent), and will burn any size coal without waste of fuel. The deep return flue steel radiator utilizes much of the heat that would otherwise go to waste, and the fire pot is made in two parts, obviating the danger of cracking. The dampers are all on the outside in plain sight, and away from the fire. The furnace is heavy and durable, and has very few joints.



The Crown Furnace.

THE TREMONT WARM AIR FURNACE,

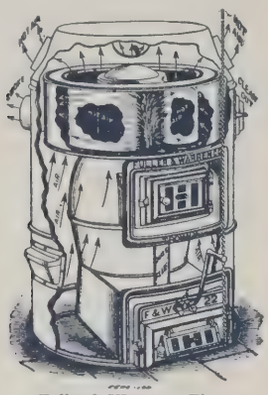
Manufactured by the Anshutz-Bradberry Co., Pittsburgh, Pa., is shown in the accompanying sectional cut. The air-heating drum has nine steel plate air-heating tubes, and a deflector distributes the heat to all parts of the radiator. Air is introduced into the combustion chamber above the fire by means of a side blast, insuring perfect combustion, thereby getting the greatest amount of heat from a given quantity of fuel. The fire pot and ash pit are connected by means of a dust flue. The radiating surface is increased by means of the ribbed construction of the fire pot. The furnace is provided with double cement cup joints, clinker cleaner, heavy and easily operated draw center shaking grate, and deep ash-pit. Special registers for each size furnace are provided when the cold air is taken from the cellar.



Tremont Furnace.

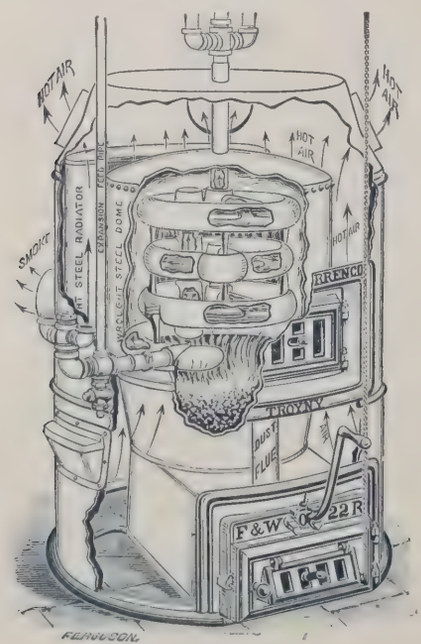
F. & W. CO. FURNACES AND COMBINATION HEATER.

A portable form of one out of the twenty different styles of furnaces manufactured by the Fuller & Warren Co., Troy, N. Y., is shown by Fig. 1. The furnace shown is fitted with the company's steel horse-shoe radiator, and is made in nine sizes with fire pots varying from 16 to 35 inches in diameter, with a casing diameter of from 28 to 65



Fuller & Warren.—Fig. 1.

inches, and a heating capacity of from 8,000 to 80,000 cubic feet. It is provided with the company's patent triangular grate, any part of which may easily be removed without disturbing the other portions of the furnace. The ash pit is large and deep, the furnace being said to be economical in the consumption of fuel on account of the ease with which the fire may be controlled, means being provided by which this may be done from the floor above the furnace. The steel radiator is constructed of the best polished extra heavy wrought steel, and all parts are exposed to the direct action of the heat. A large clean out door in the casing gives free access to flues when necessary, while the evaporating pans are so constructed as to be readily detached for cleaning. Fig. 2 shows one of the company's combination heaters, the hot water attachment being adapted to all styles and sizes of their furnaces. The return water entering the bottom or horse-shoe section is compelled to

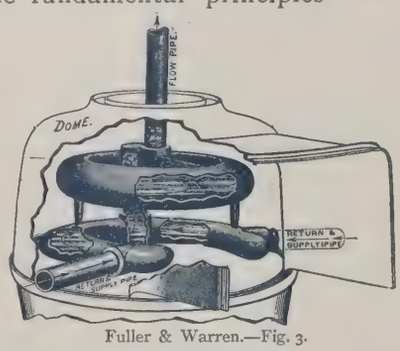


Fuller & Warren.—Fig. 2.

pass entirely around and over the top of the fire before reaching the cross connection, through which it flows upwards into the second section, entirely around in which it must travel before passing to the next section, and so on until it is distributed through the flow pipe to the different radiators. The bottom section is tapped for 2-inch return pipes, while any of the sections may be tapped for a 2 to 3 inch flow pipe. As will be seen, the surface in the hot water attachment is direct heating surface. Fig. 3 shows the hot water sections more clearly, being on a larger scale. In this engraving two sections only are shown, as applied to a combination warm air and hot water heater with cast iron dome, the return and supply pipes entering the lower section at the sides and the flow pipe connecting with the top section at the center.

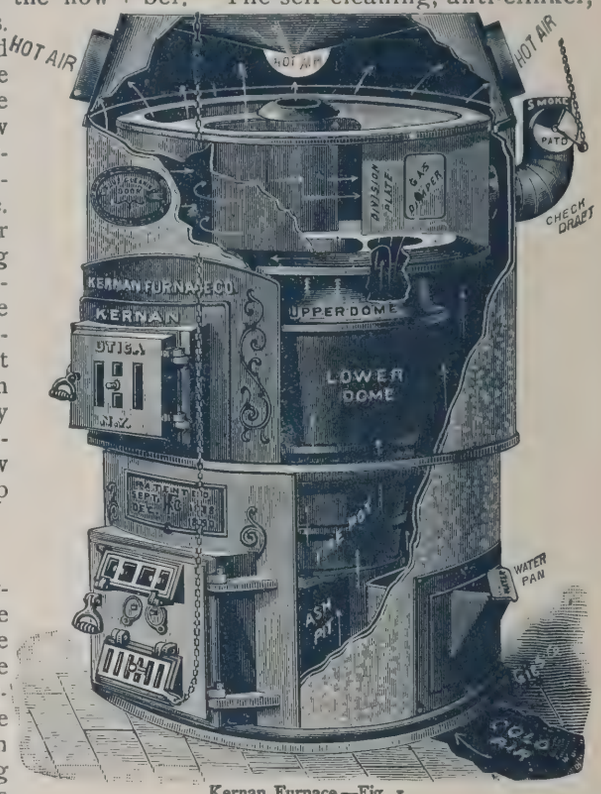
THE KERNAN FURNACE.

The furnaces manufactured by the Kernan Furnace Co., of Utica, N. Y., are known respectively as the Kernan, Kernan Union, Kernan B, and Kernan Smoke Consumer, each distinct from the other and yet embracing the fundamental principles



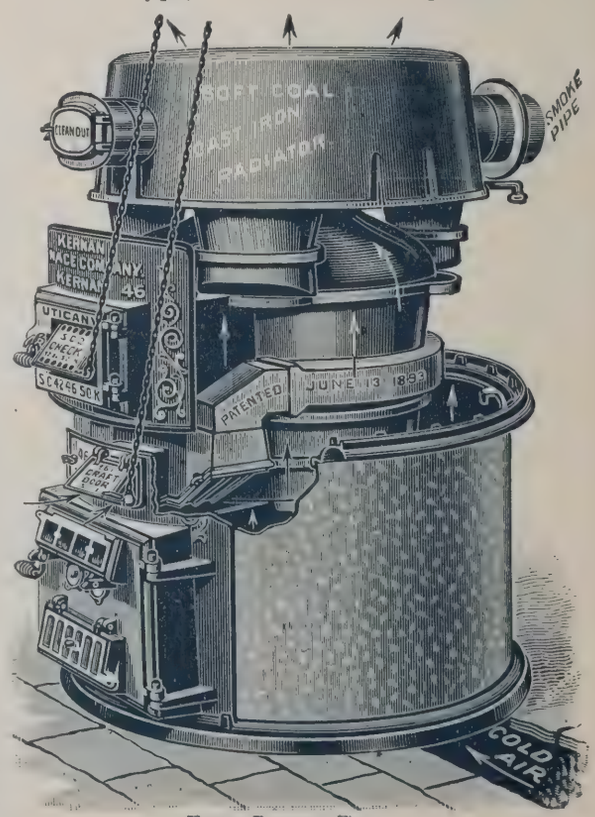
Fuller & Warren.—Fig. 3.

upon which the company believes the successful operation of a furnace rests, namely, simplicity of construction, few joints, well proportioned fire box, enlarged feed section over the fire so that the gases after being ignited have an opportunity to expand (on the principle of a bridge wall, under a boiler), a contracted connection to the radiator, but having a return flue with air spaces between the outer encircling flue, so that when the furnace is encased, either in brick or portable form, it is not only surrounded with air, but in turn the air in reaching the exit is surrounded by two heating surfaces. The Kernan, in which as in the others these principles have been embodied, is shown in Fig. 1, making a more detailed description unnecessary. Fig. 2 shows the Kernan Smoke Consumer furnace, in which the air is heated before it enters the combustion chamber, around the sides of which it is evenly discharged above the fire. This furnace has no joints which, by expansion and contraction of the furnace, will allow gas or smoke to escape into the air chamber. The self-cleaning, anti-clinker,



Kernan Furnace.—Fig. 1.

rotating bar-dumping grate, with which all Kernan furnaces are fitted may be readily removed through the ash pit door, the grate being suspended within a removable grate frame so constructed that each triangular bar has a center support. The Kernan furnace is made in brick set or portable form wholly of cast iron or with heavy steel plate radiators, Fig. 1 showing the latter type, in which the products of

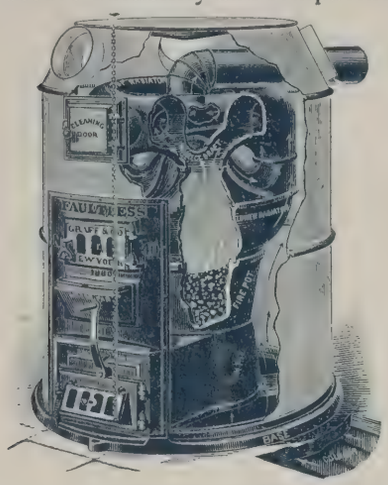


Kernan Furnace.—Fig. 2.

combustion, are compelled to travel the entire circuit of the radiator before reaching the chimney.

FAULTLESS FURNACE AND COMBINATION HEATER.

This furnace is made in six sizes in both brick set and portable form, Fig. 1 showing the latter form. The manufacturers, Graff & Company, 208 Water street, New York, have aimed to secure durability and compactness,



Faultless Furnace.—Fig. 1.

and to combine with these features a construction by which a large saving of fuel can be effected. The radiating sections are one-piece castings which present a large surface. The furnace is provided with the well-known Smyth triangular revolving grate. The combination heater is

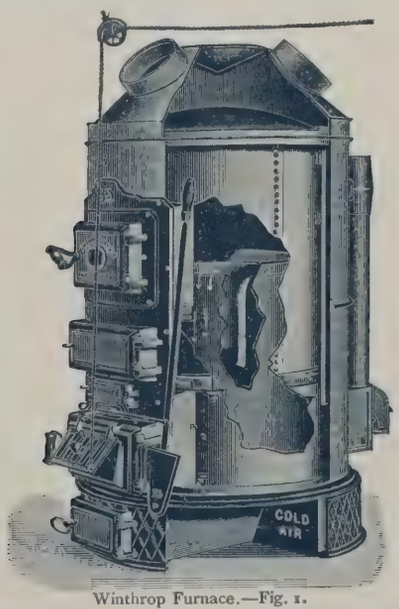


Fig. 2.

made by applying a hot water attachment, Fig. 2, which is placed between the lower radiator and the fire pot.

WINTHROP WROUGHT IRON FURNACE AND COMBINATION HEATER.

The manufacturers of this furnace state that it has no pipes with cemented joints from which gas is liable to leak, but that everything is tight, and all poisonous gases pass off through the smoke pipe. The radiator is made of wrought iron tightly riveted, the fire



Winthrop Furnace.—Fig. 1.

pot being a cast iron cylinder lined with fire brick. The lower section of the furnace is made of cast iron in order to secure durability. The arrangement of the grate is such that it can be removed

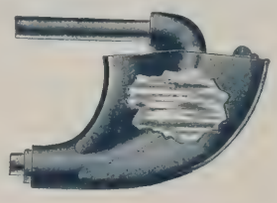
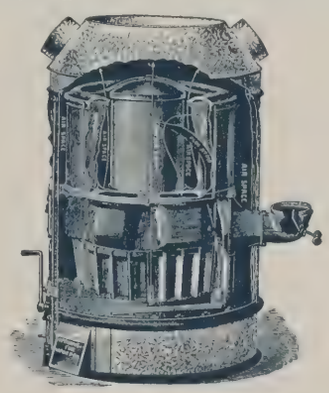


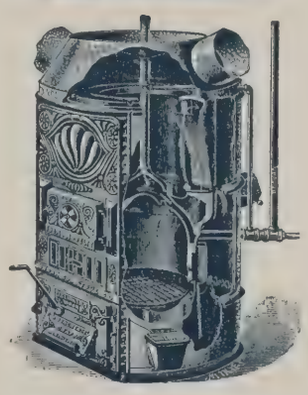
Fig. 2.

when necessary and a new one put in without disturbing the linings. All the parts being accessible, the furnace is readily cleaned. The Winthrop combination heater is made by adding to the furnace the water heating attachment shown in Fig. 2, which is cast in one piece and occupies a position in the furnace just above the fire pot, where it receives the direct rays of the fire. The Dighton Furnace Co., North Dighton, Mass., are the manufacturers.

IDEAL NOVELTY FURNACE AND COMBINATION HEATER.

Both furnace and combination heater, Figs. 1 and 2, are made in six



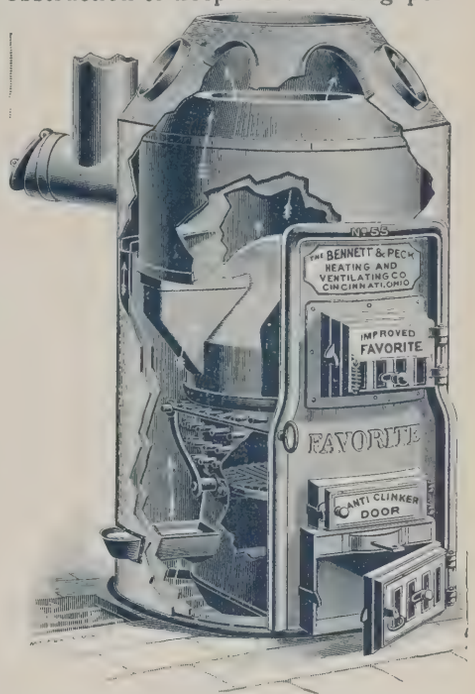


Ideal Novelty.—Figs. 1 and 2.

sizes, and are designed for burning hard or soft coal, coke, or gas. The construction is well shown by the accompanying cuts, so that a detailed description is unnecessary. The Abram Cox Stove Co., American and Dauphin streets, Philadelphia, are the manufacturers.

BENNETT & PECK FURNACES.

Of the two accompanying cuts of furnaces manufactured by the Bennett & Peck Heating and Ventilating Co. of Cincinnati, the smaller shows their school heater, and the larger their residence heater. In both heaters the parts exposed to the greatest heat are covered with pins or fingers to increase the radiating surface. In the school heater the tubes through which the fresh air passes are placed at an angle of about 60 degrees, and form a cross on the inside of the furnace immediately over the fire, the hot gases, etc., passing over and around between these tubes and the outside corrugated pieces. The manufacturers state that all surfaces are so arranged that the air comes in direct contact with the iron, with no obstruction to keep it from rising per-



Bennett & Peck Residence Furnace.

pendicularly in natural courses, which insures a rapid absorption of heat, no friction, equal expansion and contraction of all parts, and durability. These furnaces are simple in construction,

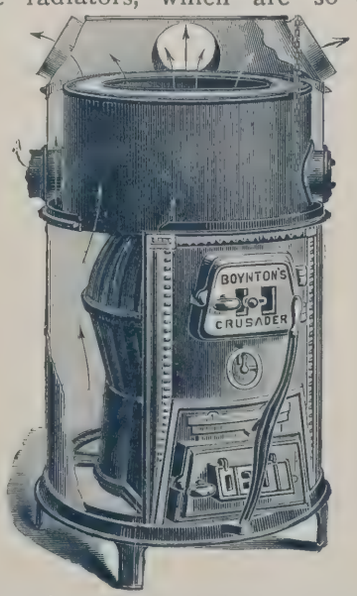


Bennett & Peck School Furnace.

with few joints, and are provided with honeycomb grates and large ash pits.

BOYNTON'S CRUSADER FURNACE

Is made by the Boynton Furnace Co., 207–211 Water street, New York, in ten sizes, with cast-iron or steel plate flue radiators, which are so con-



structed as to retard the products of combustion until all available heat is radiated. They are easily cleaned,

The Wolpert Air Tester.

J. H. Kinealy.

In ordinary tests for impurity of air in a room, to determine the sufficiency or insufficiency, of the ventilation, the amount of carbon dioxide, or carbonic acid gas as it is sometimes called, is usually taken as the sole index of purity, not because it is the most injurious gas that is, or that may be, in the air, but because it is one whose presence is easily detected and whose amount depends, everything else being constant, directly upon the ventilation. It is important, then, that care should be exercised in determining the amount of carbon dioxide present, and that the instrument used in the determination should be reliable in its action, and should give uniform results for similar conditions of the air. The tests upon the air of a room should, if possible, be made in that room, be easy to make, and require but a short time to complete. The instrument used, then, ought to be portable and easy to use, and, as it will be carried from place to place, it is well to have it as simple in construction as possible, so that it will not be easily deranged, or gotten out of order.

An air tester should be such that it will: (1) give uniform results for similar conditions of air; (2) be portable and easy to use; (3) be simple in its construction and not easily gotten out of order.

The first condition is the most important, and yet the most difficult to be fulfilled with those instruments that possess to a great degree the properties that make them fulfil the second and third conditions. This condition is but imperfectly fulfilled in those instruments where the air used is measured by means of a rubber bulb, which is compressed and then allowed to fill with air as it expands, for the reason that it is almost impossible to compress the bulb the same amount each time; so that the volume of air used in any one test is seldom exactly the same as that used in any other. With instruments of this class successive tests of the air in a room will give different results, on account of the difference in amounts of air used in each test.

That class of air tests whose results depend upon an acquired "milkiness" of a solution of lime-water, will seldom give uniform results for similar conditions of the air. Here the error is due to the fact that it is difficult to determine when the required amount of milkiness has been attained. The best of this class is that form that has a black bead or spot, to be looked at through the lime solution, and where the test is continued until the milkiness is such that the black bead can no longer be seen through the solution.

There are several forms of air testers that fulfil the first condition perfectly, and yet do not fulfil the second and third conditions as well as is desired. This is notably the case with those forms that have an aspirator bottle for measuring the volume of air used in a test, and a solution of phenol-pthalein to indicate when the test is completed. Of all the numerous forms of air-testers devised, it is doubtful if there is any so good in all respects as the improved Wolpert. It is made in Germany; but whether or not it is patented in this country I do not know. The one I use was imported through Richards & Co., of New York.

The instrument is exceedingly simple; and consists of a glass cylinder, about one inch in diameter and seven inches long, closed at one end, and a rubber piston which fits in the cylinder. The cylinder is graduated into cubic centimeters, and is marked, from the bottom upwards, to read as high as 50 cubic centimeters. The piston has fitted to it a hollow piston rod, the bore of which is about $\frac{1}{32}$ of an inch. The piston fits almost airtight in the cylinder, and the opening through the piston rod may be closed at the top by a rubber cap. If the piston is put into the cylinder, with the cap removed from the top of the piston rod, and is pressed down into the cylinder, the air will be forced out from it through the hollow piston rod; and if the piston is drawn back from the bottom of the cylinder, air will enter it through the hollow piston rod.

A solution of sodic carbonate, in which is put some phenol-pthalein, to give it a pink color, is used with the instrument. The makers of the instrument advise, I think, a solution made of one-tenth of a gram of sodic carbonate and one litre of water. I have been using a solution composed of one-twentieth of a grain of sodic carbonate and one litre of water. Into this is put seventy-five one-thousandths of a gram of phenol-pthalein. When the solution is alkaline the phenol-pthalein gives it a pink color, whose intensity depends upon the strength and amount of the solution; when the solution is made less and less alkaline, by the addition of carbon dioxide, the pink color becomes fainter and fainter; and, when the solution is made neutral, the color entirely disappears and the solution is colorless like water.

When used in the air tester the sodic carbonate of a known quantity of the solution is made to combine with, and its alkaline re-action be neutralized by, the carbon dioxide of a quantity of the air to be tested; and when all of it has been combined with carbon dioxide, that fact is indicated at once by the solution becoming colorless. If the exact amount of sodic carbonate in the solution were known it would be a simple matter to determine the amount of carbon dioxide that must be absorbed by a known amount of the solution in order to render it neutral It will be found, however, that such calculations are of value only for fresh solutions, as it is almost impossible to preserve the solution for any length of time without it absorbing some carbon dioxide from the atmosphere, which will weaken its strength.

To use the Wolpert air tester proceed as follows: In the outside air drop a known quantity (I use 2 cubic centimeters) of the solution into the cylinder, then remove cap from the piston rod, insert the piston and push it down until the lower edge is about the 20 c.c. (cubic centimeters) mark on the cylinder. Shake the instrument thoroughly, so that the solution will absorb all the carbon dioxide of the air in the cylinder. The cap should be on the end of the piston rod while shaking, although I have found that there is no appreciable difference in the results if it is left off always. Pull out the piston so that the lower edge is about the 30 c.c. mark, thus admitting through the hollow piston rod 10 c.c. of new air into the cylinder, and shake thoroughly again. Continue admitting fresh quantities of air, by pulling out the piston, and thoroughly shake the instrument until the solution becomes colorless. Suppose this takes place when the lower edge of the piston is at the 46 c.c. mark; then it is evident that the amount of carbon dioxide in 44 (46 – 2) c.c. of fresh, outside air is sufficient to combine with the sodic carbonate in, and thus render neutral, 2 c.c. of the solution. This test is simply to standardize the solution.

If now the instrument be taken into a room and the air there be tested in the same manner, with the same solution, immediately after testing the outside air as explained above, and it is found that the solution becomes colorless when the lower edge of the piston is at the 30 c.c. mark, it will indicate that there is as much carbon dioxide in 28 (30–2), c.c. of the air of the room as there is in 44 c.c. of the outside air; and, therefore, the air in the room contains $\frac{44}{28}$, or $1\frac{4}{7}$, as much carbon dioxide as the outside air. If it be assumed, as is sufficiently exact for ordinary purposes, that the fresh outside air contains 4 parts of carbon dioxide in 10,000 parts of air, the test of the air in the room shows that it contains about 6.3, ($1\frac{4}{7} \times 4$) parts of carbon dioxide in 10,000 parts of air.

It will be found that the results obtained by the careful use of this instrument are extremely uniform. Care must be taken, however, to wash the cylinder and piston thoroughly before each test, in order to get rid of all the carbon dioxide that will be found to have accumulated on, and in, the instrument. The best way to clean it thoroughly is to put a portion of the solution into the cylinder and move the piston back and forth in it.

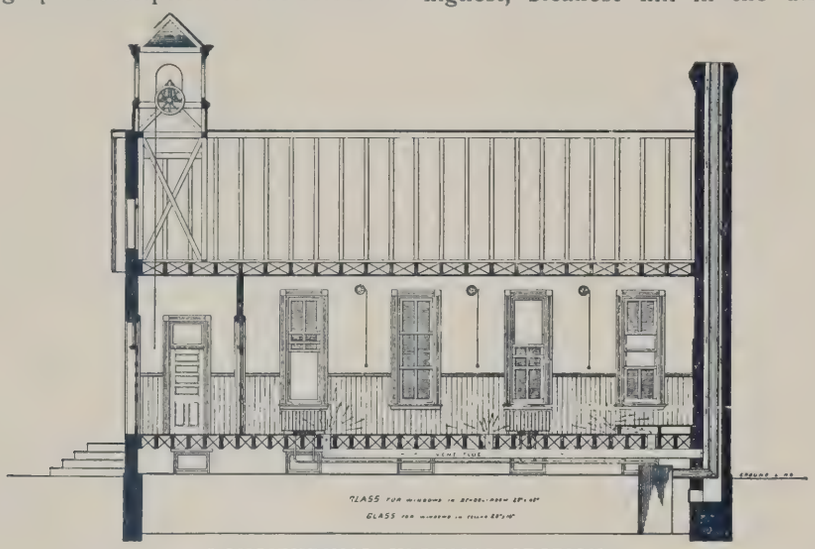
Great care is necessary to prevent the sodic carbonate solution from taking up the carbon dioxide of the atmosphere and becoming too weak for use. It cannot be kept in a bottle that is opened frequently. A friend, who is a chemist, suggested the good plan of putting the solution into a bottle tightly closed by a rubber stopper, and into which the air enters through a pipette containing caustic soda. The solution is drawn from this bottle by means of a glass siphon with a short piece of rubber tubing at the end. The flow through the siphon is controlled by an ordinary pinch-cock, such as used by chemists, on the rubber tubing.

STEAM at 150 pounds pressure costs less than 1 per cent more coal, but it is a gain of 33 per cent in power over steam at 100 pounds pressure

Heating and Ventilation of a One-Room School Building.*

BY S. T. DAVIS, M.D.

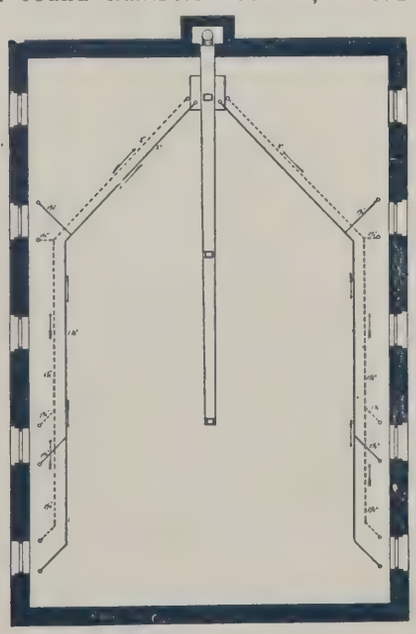
In order that I might satisfy myself as to the best methods of heating and ventilating both public and private edifices, and thereby be better enabled to offer some practical suggestions, I have for several months been engaged in investigating nearly all of the principal devices in the market. In order that I may be fully understood, before taking up a description of the selected



LONGITUDINAL VERTICAL SECTION.

method of heating and ventilating, I have had some drawings made, applicable to a country school-house with a seating capacity for fifty pupils. I also want to here state that I have no interest, directly or indirectly, in any method, except for what I consider the best from a sanitary standpoint and the cost of construction.

The air-space necessary for fifty pupils should not be less than 15,000 cubic feet, or 300 cubic feet for each, which is none too much; and according to the standard which I have endeavored to establish, each pupil would require in round numbers about 2,000 cubic



CELLAR PLAN

feet of fresh warmed air each hour, and, the contents of the room being 15,000 feet, the air would have to be changed about six or seven times an hour, or for the whole fifty pupils 100,000 feet of fresh air would have to be admitted into the room and the same quantity discharged every hour.

Before proceeding to a description of the plans designed to accomplish this end, it might be well to refer briefly to the selection of a site. My school-house would not be a "schule haus an der krick," or built like a fort, as almost two-thirds in Pennsylvania are, on the highest, bleakest hill in the district, exposed to the coldest blasts of winter and the hottest rays of sun in the summer. It would be like the old hunter's trap, which he said he set "not here, not there, but just right there." The most pleasant, convenient slope, easy of access, adjacent to good, pure water, and of sufficient grade to insure perfect drainage.

The building, to accommodate fifty pupils, should be 30 by 45 feet, with a 13 foot ceiling. The cellar should be 7 feet in the clear, and 4 feet of this above ground, with sufficient well-grated windows to furnish both light and ventilation. At the end opposite the entrance is the flue, 18 by 30 inches and inside of this a terra-cotta smoke flue, ten inches in diameter, leaving a six-inch air-space between the smoothly-plastered sides of the flue and the outside of the terra cotta smoke-flue.

Referring to the plans, the furnace should be located at the stack or flue end of the building. The pipes, four in number, bifurcating, as it were, at the furnace and extending along both sides of the basement walls and close to the joist, complete the circulation in the radiators, one of the two on either side taking the hot water from the top of the furnace, the other carrying the cooler water back, and discharging it into the bottom.

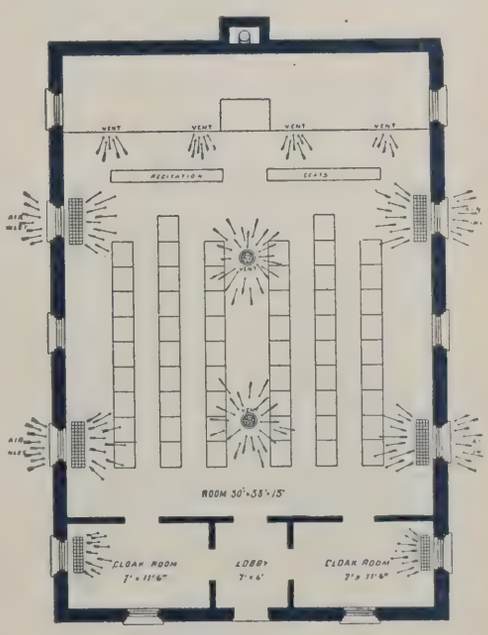
The heat given off from the furnace and the 160 feet of iron pipes averaging one and three-quarter inches in diameter is sufficient to warm the floor of the second school room. This furnace will heat our schoolroom, containing 15,000 cubic feet of air, with one-third less coal (hard pea) than any other apparatus using either hot air or steam that I have been able to find, and in a few seasons will pay for its first cost in a saving of fuel.

Starting at the stack and extending two-thirds of the distance back and immediately under the floor is a vent, eight by ten inches, constructed of galvanized iron. The stack end of this vent enters the air-flue above the point where the smoke pipe enters the terra-cotta smoke-flue; and being in close proximity to the top of the furnace, the hot air arising therefrom aids in warming the air in the vent and causes a current or suction, which draws the foul air through the registers in the floor, the first at the end of the vent-tube farthest from the flue, the second midway between the two ends, and the third under the platform.

We come now to consider the school-room proper, which is 30 by 28, by 13 foot ceiling, and is entered from the lobby, seven by six feet, or from either of the two cloak-rooms, each of which is seven by eleven feet six inches. There are eight windows in the main room, extending from a point two feet above the floor to within one foot of the ceiling. There are two windows in each cloak-room, one front and the other at the side. All the windows should be supplied with double shades or blinds, so arranged that the light can be admitted below, central, or only at the top. The radiators should be six in number, four for the main room, and two smaller ones for the cloak-rooms. The radiators in the main room should be located immediately under the windows, as indicated in the plan, two on either side. In my search for a radiator which would not only heat the air in the room but take cold air from the outside and discharge it at the proper temperature, pure and fresh, I was met by all kinds of picturesque ideas and designs.

The radiator selected meets all requirements and makes ample provision for taking such quantities of air, either from the outside or inside, in such proportions as is necessary to maintain the proper purity of the atmosphere to be breathed.

The system of heating and ventilating this house involves nothing new. Simply keeping close companionship with well-known natural laws, and applying the inventions of those who have made the subject a life study, is all that is claimed.



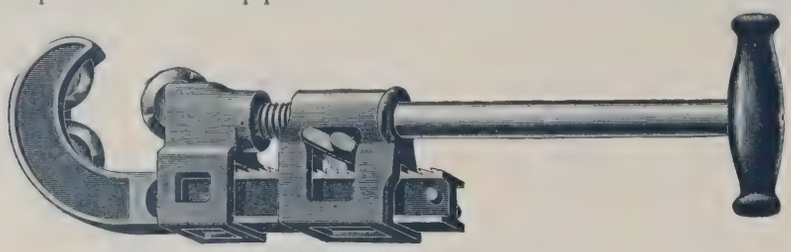
FLOOR PLAN.

* Annals of Hygiene.—Extract from a paper on the Sins of Omission and Commission in our Common Schools.

NEW SPECIALTIES.

THE ARMSTRONG PIPE CUTTER.

The construction of this tool is clearly shown by the engraving, and is generally well known. Only the best quality of steel and iron is used in its manufacture, and it is in consequence very strong and adapted for long service. It is rapid in its working, and takes a large range of pipe, each size wrench cutting three sizes of pipe. The manipulation of this pipe cutter



THE ARMSTRONG PIPE CUTTER.

is effected with ease and facility, being adjusted to the size of pipe to be cut by means of the ratchet and pawl which holds the hooked bar in position. The cutter is furnished with three interchangeable wheels, so that where the nature of the work demands it, rollers may be substituted for the two wheels at the end of the hooked bar, making a one wheel tool of it, thus giving the operator the option of a one or three wheel cutter, as desired. The Armstrong Manufacturing Company, Bridgeport, Conn., whose New York office is at 139 Center street, are the manufacturers.

CHICAGO QUICK-OPENING RADIATOR VALVE.

The cut presented herewith shows a new quick-opening hot water union radiator valve which is being placed on the market by the Roe-Stephens Mfg. Co., of Detroit, Mich. The manufacturers state that this valve has all the merits of self-packing as the stuffing-box can be packed at any time

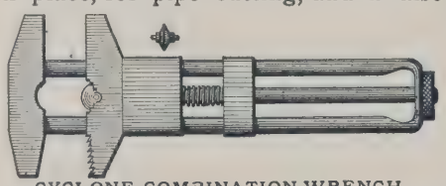


CHICAGO RADIATOR VALVE.

without shutting off the water. The body of the valve is heavy, symmetrical, and of the best steam metal. The disk is cast brass and of good weight, with a by-pass that assures perfect circulation. It is said that this valve can be sold at about the same price as the ordinary valve which it is designed to replace.

CYCLONE COMBINATION WRENCH.

This device may be used as a pipe wrench, a nut wrench, and a pipe cutter. Midway on the parallel bars which form the handle is secured a keeper, which forms a bearing for the adjusting screw, as shown in the cut, a shoulder at each end of the shank of the screw holding it in position longitudinally. The movable jaw is sleeved on the parallel bars, and is adjustable to and from the fixed jaw by turning the milled nut at the end of the screw shank. One pair of jaws are parallel, the others being flared, and one of the latter being toothed for gripping pipe. Between the bars the jaws are hollowed out, one recess being toothed for pipe work and also fitted as a bearing for the small cutter wheel, which is shown in place, for pipe cutting, and is also



CYCLONE COMBINATION WRENCH.

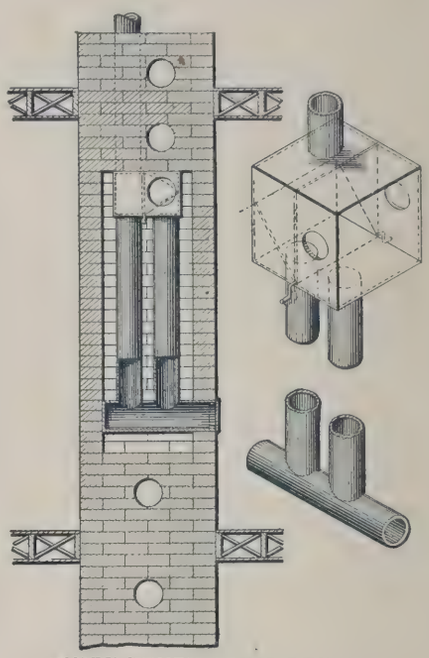
shown detached. The wrench is simple, strong, and serviceable, and is well spoken of by those who have tested it. The inventor is H. A. Post, of Wichita, Kan., F. W. Wright, of the same place, being joint owner of the patent.

SMITH'S HEATING AND VENTILATING DEVICE.

This device consists of a square drum connected with downcast and upcast radiating pipes, all inclosed in a suitable cavity in a wall or chimney. The device is shown in place and also in detail in the accompanying cuts. The drum is divided into two compartments by a damper, the pipe from one or more stoves being connected to one compartment and the outlet to the chimney being connected to the other. The operation is as follows: The damper is throw back giving direct draft from the stove to the chimney, until the fire is well under way. The damper is then closed, and the products of combustion are forced to pass down one radiating pipe and up the other before going to the chimney, thus heating the air in the space around the radiating pipes. A cross pipe at the bottom of the latter admits of the removal of any accumulations of soot, etc. Suitable openings and registers in the walls admit the cold air to be heated and pass the heated air to the rooms to be warmed. Abram H. Smith, Memphis, Mo., is the inventor.

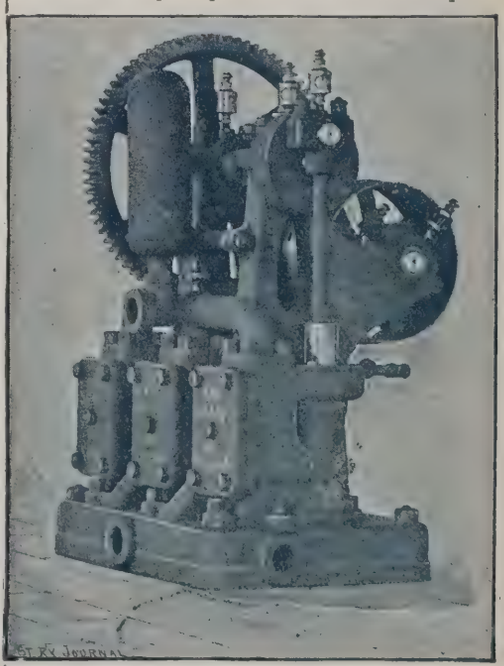
THE DEANE STEAM PUMP.

The triplex power pump shown by the accompanying engraving has but recently been placed upon the market,



SMITH VENTILATING DEVICE.

and is designed particularly for situations where steam is not available or where its use may be objectionable, and especially is it adapted to be operated by electricity. It is compact in form, every part of it being easily accessible for inspection or repairs when necessary. This design of pump lends itself to a large and varied field of uses, such as boiler feeding or elevator work, either on the closed or open system, and can be conveniently arranged to run with any form of electric motor. The regular pattern is intended for belt power, and is supplied with tight and loose pulleys which, with the gearing, are carefully proportioned and of ample strength. All the bearings are lined with phosphor bronze and sup-



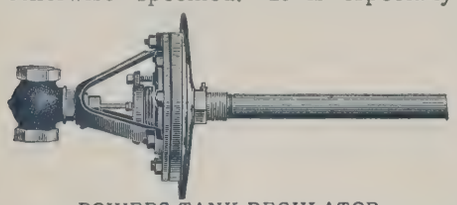
THE DEANE STEAM PUMP.

plied with tasteful glass oilers. For supplying water to tanks and for general distributions in hotels, large office buildings, or apartment houses, it has

many advantages, the arrangement of the plungers, connected as they are side by side on a rotating shaft carrying three cranks which are placed at an angle of 120 degrees to each other, giving a steady unvarying flow, free from jar and shock, and running with practically no noise. Every pump is guaranteed by the manufacturers, the Deane Steam Pump Co., 72 Cortlandt street, New York, to give satisfactory service under all circumstances.

POWERS TANK REGULATOR.

The accompanying cut shows a regulator designed for controlling the temperature of water in tanks heated by steam, being adjusted to maintain a temperature of 185 degrees F. unless otherwise specified. It is especially

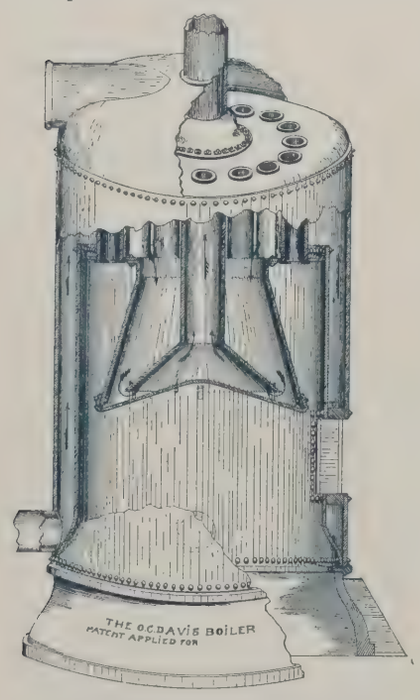


POWERS TANK REGULATOR.

adapted for use in hotels, asylums, apartment houses, etc., where a constant supply of water at a proper temperature is required, its use preventing boiling in the tank, steaming at the faucets, etc. In applying the regulator where high pressure steam is used the manufacturers (the Powers Duplex Regulator Co., 36 Dearborn street, Chicago, Ill.) advise the use of a pressure regulator by which the pressure can be reduced to 5 or 6 pounds. The A. A. Griffing Iron Co., Jersey City, N. J., are the general Eastern and Southern agents.

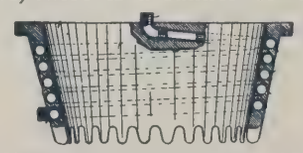
DAVIS HOT WATER HEATER.

This heater is provided with an inner and an outer shell, the former forming the outside of the fire box, and extending from the bottom to within a few inches of the top of the boiler. Over the top of the fire box there is, as



DAVIS HOT WATER HEATER.

shown, a crown sheet, from which hangs a large drop tube, in the form of a cone, base downwards, which extends to within 10 or 12 inches of the fire, leaving a space of about 1½ inches between the cone and the side of the fire box for the passage of the products of combustion. Over the lower crown sheet, and inside of this drop tube over the fire, there is a funnel or canopy

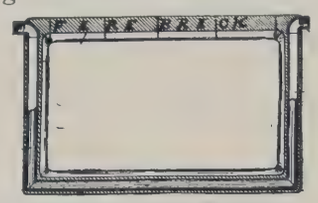


STUBBS' HEATING APPARATUS.—SECTION.

with its large opening downward and raised up off the sheet, so that the water can get under it readily. The water passes over the smoke surface, as indicated by the arrows, while it is cold, and then down to the intense heat of the crown sheet, from which it finally passes up and out of the heater. The heater shown is designed for burning hard coal, and is manufactured by the Davis Heater Co., 612 Wisconsin street, Racine, Wis.

STUBBS' HEATING APPARATUS.

Dr. Roland H. Stubbs, of Waterford, N. Y., has invented an improvement in heating apparatus for which he has recently been granted a patent. The invention consists in an ingenious method of providing the fire pot of an ordinary stove or range with a water or steam passage by casting the metal around a thin pipe which forms a permanent hollow core. At the inlet and outlet of the passage so formed are secured coup-



STUBBS' HEATING APPARATUS.—PLAN.

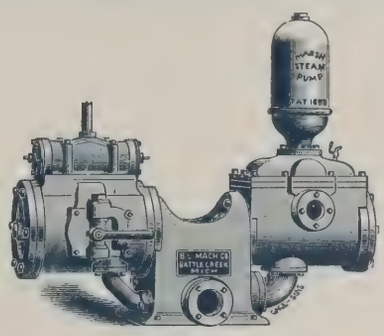
ling sections of heavier pipe, either by casting in place or by bolting them to the fire pot afterward. As the heavier coupling sections provide for the necessary connections, the rest of the pipe need be only of sufficient thickness and strength to withstand the operation of casting, the cast metal furnishing the required strength for the passages. In practice tubes of ordinary sheet iron are used for the core pipes, which are easily cut or bent to shape, and admit of a comparatively thin casting. The sectional cut shows the device as cast in a circular fire pot, and the plan shows its application to a fire pot of rectangular form.

THE MARSH STEAM PUMP.

The pump shown by the cut presented herewith is adapted for handling the water of condensation from radiators, steam coils, etc., feeding it in its hottest condition directly to the boiler and doing away entirely with the expense of traps, tank, float, and balance steam throttle valves, returning the condensation in a steady continuous flow, and thereby accelerating the circulation of steam and increasing the efficiency of the radiation, with a positive saving of fuel. In this pump the use of springs and fibrous packings is obviated by using the company's patent all-metal water valves and all-metal water piston packing. The pump is self regulating and can never run too fast to take suction, neither would any injury occur to the moving parts should the water supply give out when the throttle is wide open. The valve has no dead center, and will always start when steam is admitted. The Battle Creek Machinery Co., Battle Creek, Mich., are the manufacturers.

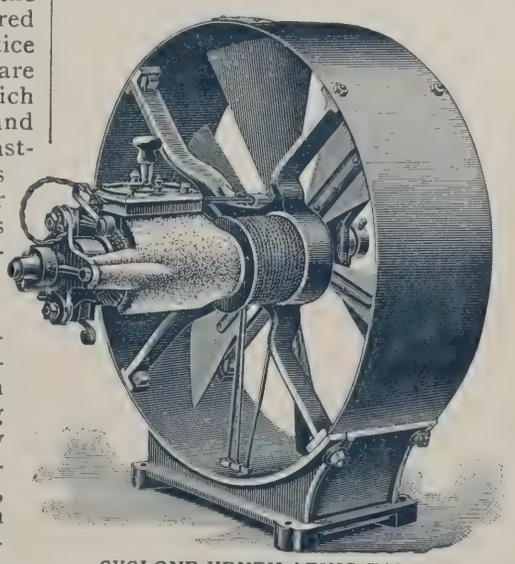
CYCLONE VENTILATING FAN.

This fan, which has just been placed on the market by the Huylett and Smith Mfg. Co., of Detroit, Mich., for use in cooling and ventilating hotel



THE MARSH STEAM PUMP.

kitchens, restaurants, etc., was designed to meet the demand for a fan of moderate cost, it being impossible to manufacture the standard Smith ventilating fan (on account of its substantial construction) at a price to compete with other makes. The Cyclone fan is furnished either with pulley or with direct attached electric motor, the motor used being what is known as the Fuller patent electric motor, furnished with a three-speed switch. The pole pieces of the motor being parallel with the fan shaft, the spider or arms of the fan frame being utilized as a keeper of the two magnets, the breaking space of the poles is brought into a vertical position, removing all danger of short circuiting the magnetic lines of force across the poles. The commutators are thoroughly insulated with mica, so that there is no danger from short circuiting. This



CYCLONE VENTILATING FAN.

combination fan and motor is carried in stock at the main office and at the company's various branches, wound for 110 and 220 volt currents; or they can be furnished wound for any voltage.

Heating and Ventilation

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ELECTRIC cooking and heating are just now attracting considerable attention, a comparison of the former with the cost of cooking by stoves having shown that an enormous waste of heat takes place with ordinary cooking stoves in which it is possible to secure an all-day efficiency of only about four per cent.

UNECONOMICAL as are cooking stoves, it has been found that as a means of heating water for any purpose electricity cannot hope to compete with ordinary methods of heating though the electric oven does compare favorably with the cooking stove as regards cost of operation, and is likely to find extensive use on account of its cleanliness and convenience and the absolute accuracy with which the cooking operations can be carried on.

COMMENTING on electric heating and cooking in relation to central station works, W. S. Hadaway Jr., has said, "In domestic life no source of heat offers so many elements of value as the use of electricity for cooking and laundry work. There is no discomfort, no noxious gases from combustion, and the temperatures attained are constant, so that the question of the discretion of the cook is eliminated, and better results obtained than can possibly be reached from the approximate temperatures of surfaces heated by combustion. It may be fairly stated that the people who could afford to do their lighting by electricity could afford to do their cooking and ironing by the same means. At the outset of course the cost of electrical energy as fuel under average conditions at the power rate will be greater than fuel directly burned. But there are compensating advantages gained which more than offset the additional cost. This has been abundantly proved in actual practice. The saving of attendance and of time, freedom from dirt, coolness of the kitchen, absolute uniformity of heat and ability to regulate it, appeal at once to the householder. There is merit aside from novelty in such practice. Electricity for heating will be found of the same value to central station electric lighting companies as the use of gas for fuel purposes has proved to the gas lighting companies. Its value lies largely in ability to localize the heat, and it will not be found desirable to use it on a large scale where diffused heat is wanted. High temperatures and small quantities are the proper uses for electricity for fuel."

"MORE and more attention," the writer continues, "is being given to heat engineering in connection with steam electric plants. For economy of operation it is as necessary to regard electric plants as heat plants, as it is to recognize in solar action the origin of all our sources of heat. Where engineers are striving for highest effects in lighting and power, we can trace a disposition to consider the heat efficiency of secondary importance. In heating by electricity, on the other hand, all the energy generated is expressed in terms of the same mechanical equivalent, and properly treated on an engineering basis, will undoubtedly aid in the more effective utilization of fuel.

"ELECTRIC heating should be recognized in central station work as an additional outlet for power; and grasped and exploited as such. It was not simply the desire for electric lights that induced so many people to use them; but an aggressive campaign on the part of the station men as a source of revenue. With electric heating apparatus some of the most progressive will have it anyway; but in summer work, its value will be fully shown only by a determined effort to sell current to restaurants, cafes and dwellings. The manufacturer cannot be expected to do this work; but by proper co-operation good results will be reached of value alike to the manufacturer, central station and customer."

INCORRECT statements on the part of manufacturers of heating apparatus not only bring discredit upon themselves, but tend to stigmatize the business as one in which it is necessary to make wildcat statements in order to secure the attention and possible patronage of the trade. In these days, when it is common practice to employ the services of competent engineers, it is not only a reflection upon the intelligence of the engineers to make "boot-strap" assertions, but upon that of the legitimate trade press, which refuses to be hoodwinked and aims to give its readers the whole truth and nothing but the truth.

ACCORDING to the published report of a test of a new candidate for the favor of the heating trade it is claimed that $13\frac{8}{17}$ pounds of water per pound of combustible were evaporated from a temperature of 62 degrees into steam at an average temperature of $212\frac{1}{2}$ degrees. The amount of coal fed to the boiler was 153 pounds, the refuse weighed back at the close of the test being 56 pounds, making the net combustible used 97 pounds. The amount of water stated to have been evaporated with this amount of combustible from a temperature of 62 degrees into steam at an average temperature of $212\frac{1}{2}$ degrees was 1,350 pounds. For the evaporation of 1,350 pounds of water from a temperature of 62 degrees into steam at $212\frac{1}{2}$ degrees, 1,507,450 heat units are required, this being determined by multiplying the number of pounds of water evaporated by the difference between the total heats respectively of the steam at the average observed temperature and of the water at the average observed temperature of feed. The total amount of heat in the 97 pounds of combustible, giving to it a calorific value of 14,500 heat units per pound, would be 1,406,500 heat units. In other words, it would appear that the manufacturers have either been able to make 1,406,500 heat units do the work for which 1,507,450 heat units are required or else by some mysterious process have been able to take out of the coal more heat than there is in it.

Warming and Ventilation.—IV.

Geo. W. Kramer

As previously stated, preceding papers have been of a theoretical and prefatory character; succeeding ones shall be largely practical, based on experiment and experience. While experiments have not been systematically conducted they have been sufficient to demonstrate the approximate correctness of involved theories.

It shall be my purpose later to give the readers of this paper the result of proper tests and experiments.

The primary object of all heating apparatus is to raise the temperature of the air of the compartments to be warmed, and through this medium that of the contents and wells, using air as a vehicle to convey the heat. This heat is produced by the combustion of fuel in an apparatus provided for this purpose, located outside and at a greater or less distance from the apartments. This apparatus is known as the furnace. There are furnaces and furnaces in endless variety, and, strange to say, the advocate of each is willing to guarantee that he can produce results 10 per cent greater than can their competitors.

Before selecting a furnace we should ascertain what would be the proper form, construction, and material which would be theoretically conducive to the best results, then ascertain by experiment if theories are correct in practice.

By referring to previous data we find that one pound of coal (as the standard fuel) will produce with perfect combustion 1,400 heat units, and that one of these units will raise the temperature of about 40 cubic feet of air one degree Fahrenheit.

We ascertain, however, that what is theoretically possible is only possible in practice to the extent of 40 to 50 per cent.

There must be some radical defect, either in the combustion of the fuel, in the construction and form of appratus, or in the transfer of the heat to the air, to account for this serious loss of energy. On the same principle that he is a public benefactor who can make two blades of grass grow where but one grew before, the benefactor in economic heating is he who can save this loss and make one pound of coal do what has heretofore required two.

Let us first consider the conditions essential to perfect combustion and see whether they have received proper consideration in the arrangement and construction of the modern furnace for bringing together the elements necessary to combustion.

For uniform and continuous combustion the elements should meet at nearly the proper temperature in a regular controllable quantity and continuous supply. The fuel should be of such character as to render these conditions possible. Before proceeding further, however, let us observe a simple example of complete combustion which we find in the flame of the candle.

This consists of three parts, (*a*) the central unburned vapors, (*b*) the luminous portion where the particles of carbon become white hot but are still unburned.

The exterior (*c*) is where we find complete combustion and where the greatest heat is derived.

It will thus be noticed that light is due to incandescence or incomplete combustion, while heat is the result of complete combustion; but the instant we interrupt the natural process by a current of air or the interposition of some object interrupting the outflow of the products of combustion, complete or perfect combustion is then impossible and the unconsumed carbon will be deposited as soot or smoke.

These are points well to consider: first, there should be no flow or current of cold air to the locality where combustion takes place, except the proper controllable supply; second, the discharge of the products of combustion should not be retarded or intercepted.

Air, from which we must draw our supply of oxygen, consists of one part of oxygen to four parts of nitrogen; hence every particle of oxygen must be accompanied by four particles of a material which does not minister to the purposes of combustion,



but which takes up heat and thereby expands in volume. Hence provision must be made for its ingress, expansion, and egress from the combustion chamber. The product of the chemical union or combination called combustion, is carbon-dioxide, every molecule of which consists of three atoms, as it requires two atoms of oxygen to carry one of carbon. The affinity of these elements for each other under proper conditions, however, is such as to break all previously existing bonds, and they rush into union with a mighty force.

This force generated in a combustion chamber, by the release of atoms from chemical combinations, and the rush and swing of atom against atom in forming new compounds, results in the elevation of the mass to a very high temperature and an intensity of motion, forming great tongues and waves of flame, impinging on the walls of the combustion chamber.

As previously noticed, the flame of the candle concentrates to a point, being of greatest volume at its base, the walls confining the natural combustion of the candle being the surrounding air, being free to assume the natural form. Is there not a suggestion in this? Also, observe where the air meets the carbon. Would we secure *better* results if the air were drawn through the fuel, as is done in common practice? Let us consider the operation and result. Air taken up through a mass of fuel resting on a grate becomes rapidly heated, as the fuel is in a state of combustion. When the air reaches the proper temperature the oxygen will unite with the carbon of the fuel. Supposing the oxygen of the air takes on all the carbon it can carry before it reaches the surface of the fuel or combustion chamber, what will be its influence on the combustion at this point, being then nitrogen and carbon dioxide? Is not this the same compound with which chemical fire extinguishers are largely charged? Should we not rather supply the oxygen direct to the point of combustion? In ordinary practice, this checks or baffles the fire because introduced cold, and the only assignable reason for supplying air through the fuel is for the purpose of properly heating it. Therefore, if brought to the proper temperature and supplied in the proper place, air should secure a perfect and complete combustion.

This is in all cases the natural process. There should be no necessity for opening any door to the combustion chamber, except for retarding the fire.

As regards the form best adapted for the combustion chamber, let us examine the average furnace and its operation. The air passes up through the grate, striking the fuel at the bottom, cold; before reaching the chamber a large portion is charged with carbon; this, with the four parts of nitrogen, makes a great mass of heated incombustible gases; expanded by heat, liberated carbon not consumed becomes hot and luminous. The complete combustion, as in the candle, and the greatest heat, takes place in the outer margin, with a great mass of useless matter to carry off in the heart of the chamber. Now if we could interpose some substance into the interior, forcing the inert matter along with the intensity of action, and extracting all heat except that necessary to carry off the products of combustion, making the heat more available by thus securing more surface, could we not by this means secure better result and better combustion? Especially, if we should supply the fuel to the heart of the fire, there to meet the oxygen, both at the proper temperature and under control, would this not secure an ideal and perfect combustion? All parts of the apparatus must be properly constructed, proportioned, and assembled, to counteract the effects of expansion, contraction, etc. Its capacity should be such as to retain the products of combustion until all heat has been extracted except that necessary to carry away these products. In order to accomplish this quickly, the form should be such as to develop as great vertical surfaces as possible, as the natural movement of air as it becomes heated is upward, horizontal surfaces being of but little value to any apparatus.

(*To be continued.*)

For a cement to fasten iron to stone, take 20 parts of iron filings, 60 parts of plaster of paris, and 1 part of sal ammoniac; mix with weak vinegar to a fluid paste and apply at once.

Details of Work.

Hugh L. Barron

My object is to say something from the standpoint of the small shop, relating to its practical experience. To the constructor or technical man the execution of work is of far more interest than the method of getting it or the money he gets for it. To the commercial man the reverse is the case. To his mind, getting contracts and the profit that can be got out of them are of most interest; mere details of work are of secondary importance.

I know how feeble all talk about work really is. The theorist talks and talks, and his words seem clear, but attempt to put his talk into practice and all is chaos. The man that can do things has no need for talk,—he does them. When a man does anything worth doing he does it in a way that neither he nor any other man can explain. The best work is spontaneous and individual, and defies words. The great workers of the world are silent men. There is, however, sometimes pleasure, if not profit, in talking about your work, and that will be my excuse for presenting these few desultory details.

Our firm (Barron Steam Heating Co.) uses no particular make of pipe or fittings. As far as our experience goes, one make is about as good as another, and all makers sometimes send out inferior pipe. We are at present using steel pipe, and find it entirely satisfactory. It is a little hard on the dies, but that is a problem for the die maker; we are sure he will meet it without any difficulty.

Since writing the foregoing in regard to steel pipe, we have been led to modify our opinion considerably. A few weeks ago we got a shipment



FIG. 1.

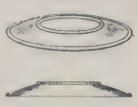


FIG. 2.

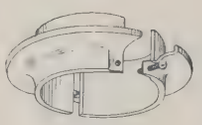


FIG. 3.

of very good wrought iron pipe, and the difference between it and the steel pipe was most marked. The iron pipe was soft and easy to cut, the steel pipe very hard. The men claim they can almost cut two 1½-inch threads on the wrought iron while they are cutting one on the steel, and I think if it was left to the workmen there would be little steel pipe used.

To anneal the steel pipe after finishing would cost so much as to probably make its price prohibitory, but I am inclined to believe that the steel pipe maker will find some way to turn out a satisfactory product. We use gate valves whereever possible, and globe or angle valves with Jenkins seats. We use very few brass seated valves. We do not use jack chain, or eye-screws, or any other home-made form of pipe hanger, using entirely the patent hangers of various makers, all with split rings. It would be impossible to get New York workmen to use solid ring hangers with any degree of satisfaction. We use galvanized iron, gauge No. 26, to make all our slip tubes. They are made in halves, as shown in Fig. 1, with two tin straps on the bottom section of the tube to turn over and nail to the floor, to get the tube in the correct place. They are always one inch larger in diameter than the pipe, a two inch riser having a three inch tube. We use a round floor plate, Fig. 2, and a split ceiling collar, Fig. 3; this is for single pipe. For double pipe, with or without an air line, we use riser plates, Fig. 4, the same plate answering for floor and ceiling, and having galvanized iron casing.

In considerable of our work the builder leaves a 4 by 8 inch flue in the wall for the riser. This dispenses with all floor and ceiling plates and tubes, and is the way we prefer to do work. We use no lead, all joints being made metal to metal. We use a right and left coupling, Fig. 5, made of cast iron, and extra heavy. We use this on all riser connections up to two inch. We abandoned the use of malleable couplings several years ago, because they would stretch and cause leakage, being made too light. Wherever possible we take radiator connections above the floor. The tubes are made in halves, so that we can take them above or below when called for. The radiator feet we use under sectional radiators, Fig. 6, allow us to take connections in that manner.

We do both single and double pipe work, and find that there is absolutely no difference in cost, one method being just as cheap or dear as the other. This no doubt will surprise many, but that is our experience. We also find that cutting pipe by hand on the job or cutting by machine in the shop makes no practical difference in the cost of the work. I do not think this is the general experience, but it is ours. We also find that continuous mains cost no more nor no less than separate steam and return mains with dripped risers. The cost of labor to us on low pressure is fifteen cents per square foot of actual radiators supplied to the building, and twenty cents on high pressure, and this varies so little from job to job that it is not worth talking about. Pipe for low pressure costs us six cents per actual square foot, fittings three cents, and valves seven cents. These figures are slightly variable, due to



FIG. 4.

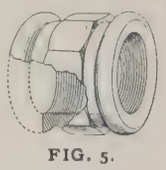


FIG. 5.

market changes. On low pressure boilers we use a water-feeder and always two damper regulators (dispensing with overhead chains), one connected to the damper in the smoke pipe and the other to the draft door on the ash-pit.

Fig. 7 shows our pump governor, which is simply a balanced valve and a float with casing. It can be put on top of the pump as shown, or lowered along side the pump if necessary. I believe that pump governors should be made and furnished by those who make a specialty of making them, and the same in regard to feed water heaters and other specialties, and that the contractor should confine himself to erecting work, the jobber to selling material, and the manufacturer to making some special article or special line of articles; but it is not always possible to make practice and belief agree. Fig. 8 shows the feed water heater which we use, and as it has some features which I believe valuable, I would ask you to examine it carefully. It combines a receiving tank, a pump governor and automatic high pressure water feeder, a distributing tank for exhaust heating, and a feed-water heater. The attachment on the side is the automatic boiler feeder and pump governor, which is connected to the boilers on the water line with steam and return pipes. The attachment in front is the automatic water feeder. The pipe inside is a large brass stand pipe with radial arms that break joint one above the other. The exhaust steam enters through the large valve on the side near the top and is distributed from the manifold in front. The return of condensation is through the large valve near the bottom. The action you will readily understand. The regulator controls the pump and water line of the boilers, and when the condensation is not sufficient to maintain the water line, the water feeder supplies the water, which falls to the bottom of the stand pipe, gradually ascending through the pipe and radial arms to the perforated arms in the top, where it falls out gradually to the bottom. As soon as the water reaches to the height of the center of the water feeder, which is the water line of the heater, the feeder closes. The very small pipe on top of the cold water supply is an accelerating pipe from the

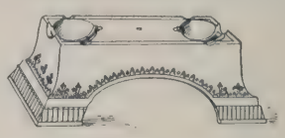


FIG. 6.

discharge of the pump. The other details need no explanation.

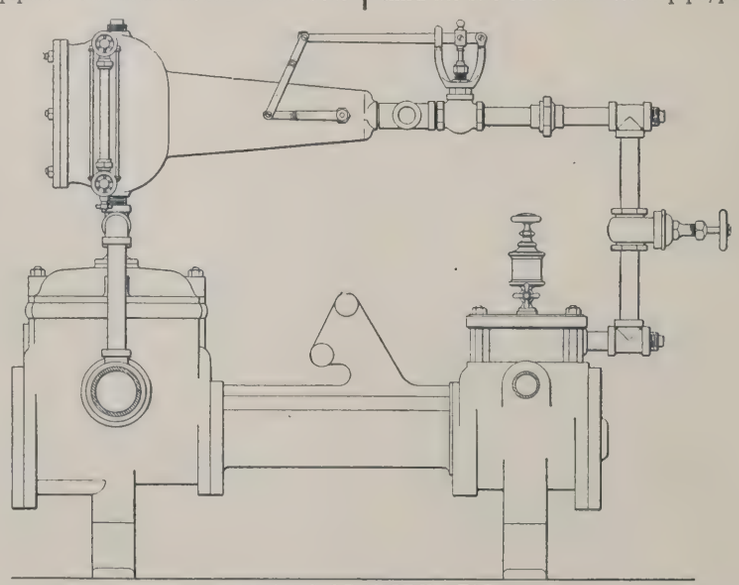
The question naturally arises with all open heaters in regard to getting grease in the boiler; there is another question that naturally goes with that, and that is the greasy smell from the radiators using exhaust steam. Now my answer to these questions is, that if there is too much grease in the boiler (for a little grease, if it is from pure mineral oil, does no harm) it is the fault either of the oil man who supplies the oil, the grease extractor or separator man who furnished the oil eliminator, or the engineer who is running the plant. They are the responsible people; it is their problem to perfect their eliminator, furnish odorless oil, and regulate its supply. I have never known a case where the fault could not be traced to those sources, or a case that could not be immediately cured, and if devices would not be used because of imaginary evils or because it requires some skill to overcome the evils, then progress would halt; but progress does not halt, and new methods and new devices for good or ill succeed the old.

Fig. 9 shows our hot water tank for both high and low pressure work, using in connection with them on low pressure work a small hot water boiler for summer use. The general way is to make these tanks with a manhole in one head. We make them now with one head bolted on, so that it can be taken off entirely. Formerly we let the brass coil project through this head, but we now put all holes in the riveted head and leave this entirely free. The reason we do this is the reason we do so many other things—we have learned from the only teacher we are bound to respect, experience.

Fig. 10, which is an engraving of our grease extractor and steam separator, requires no explanation.

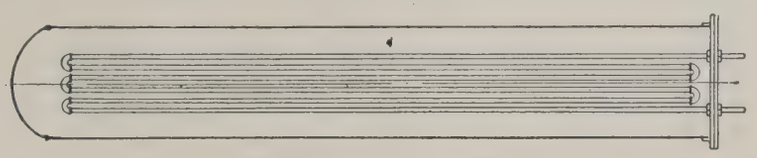
In running main pipes on work where we have a steam and return main we always make the return one-half the diameter of the steam main; thus, with 4-inch steam main we have a 2-inch return. We think this return is too large; that one-third the size of the main steam pipe, possibly one-quarter, would be nearer a correct proportion, but we do not care to go to extremes.

For repairing leaks where we cannot take down the piping or screw it up, we use a cement made of four parts of common putty, one part of fine iron borings, and one part of common salt. We have used this for years with the best results. The borings and putty must be mixed thoroughly to make what it really is, an iron paste.



DETAILS OF WORK.—FIG. 7.

The management of the steam-fitting contracting shop can best be divided into three parts: the executive, pertaining to construction; the contracting, to securing orders; and the financial, to credits, collecting, paying, and purchasing. Of these three divisions the most important is the contracting. We figure on as much work as possible, not so much in the hope of increasing the average of the amount of work we are able to get as for the purpose of advertising, as we have found that estimating is the best and cheapest way of advertising; other forms such as circulars and catalogues do not pay.



DETAILS OF WORK.—FIG. 9.

The best advertising is making plans and specifications for architects. It has been suggested that steam fitters should recommend the employment of engineers by architects for this purpose. It has also been suggested that architects should pay the steam fitter for making plans and specifications; neither of these suggestions have much following, both have some. Like every other practical problem, this is one of expediency, and as long as the steam fitter furnishes free of charge better plans and specifications than the engineer would have to be paid for the present custom will remain. It will always be to the interest of the steam fitter to furnish plans and specifications free of charge, and in fact to make efforts for that privilege, because getting the confidence of the architects is the most important element in securing work.

The keen, sometimes almost feverish, competition of the present day, with the many trade evils that grow out of it, have always their basis in the system of securing work. In the early days of the business, houses starting from small beginnings grew up gradually, and their reputation and standing slowly brought them increasing business. Personal solicitation for work was the exception, and looking after work was not developed into a system as at present. Now soliciting for work is the rule, and has been developed into an art, a very subtle art at that, with many and various ramifications. As of old, success in getting work depends very much on reputation and standing, on giving satisfaction, on being low priced, because it is hypocrisy to talk of being high priced.

I doubt very much that even in the good old days the high-priced men generally got the work. This is a very practical world, and I think the man of low prices usually has the advantage when it comes to securing orders, but in addition to all this you must keep constantly in touch with everything and everybody who has directly or remotely the giving out of work. If you wait to be sent for, if you do not employ solicitors, or solicit yourself, you are out of the world, and after your best efforts you are in good luck if you secure ten per cent of all you estimate on.

Giving the maximum of good work for the minimum of price is a very simple rule, easily stated; but as a number of people regularly retire from the contracting business, it illustrates the fact that it is not so easily followed. I doubt very much if those most expert and successful in getting work could tell how they get it. It is a complicated problem; side issues of many shades enter into it, but above all and before every other (including luck, which is a factor that is generally neglected), enters the solicitor, the number employed, and their ability and influence. The volume of business in the large wholesale trades to-day depends on the number of travelling men; volume of business to-day in steam heating contracting depends on the number of solicitors; number of travelling men and solicitors depends very largely on capital. The small steam fitter saves a great deal of money in the course of the year on the solicitors he does not employ, but the small steam fitter every hour of the day is being checkmated and foiled by the ever vigilant and enterprising solicitor of his larger rivals.

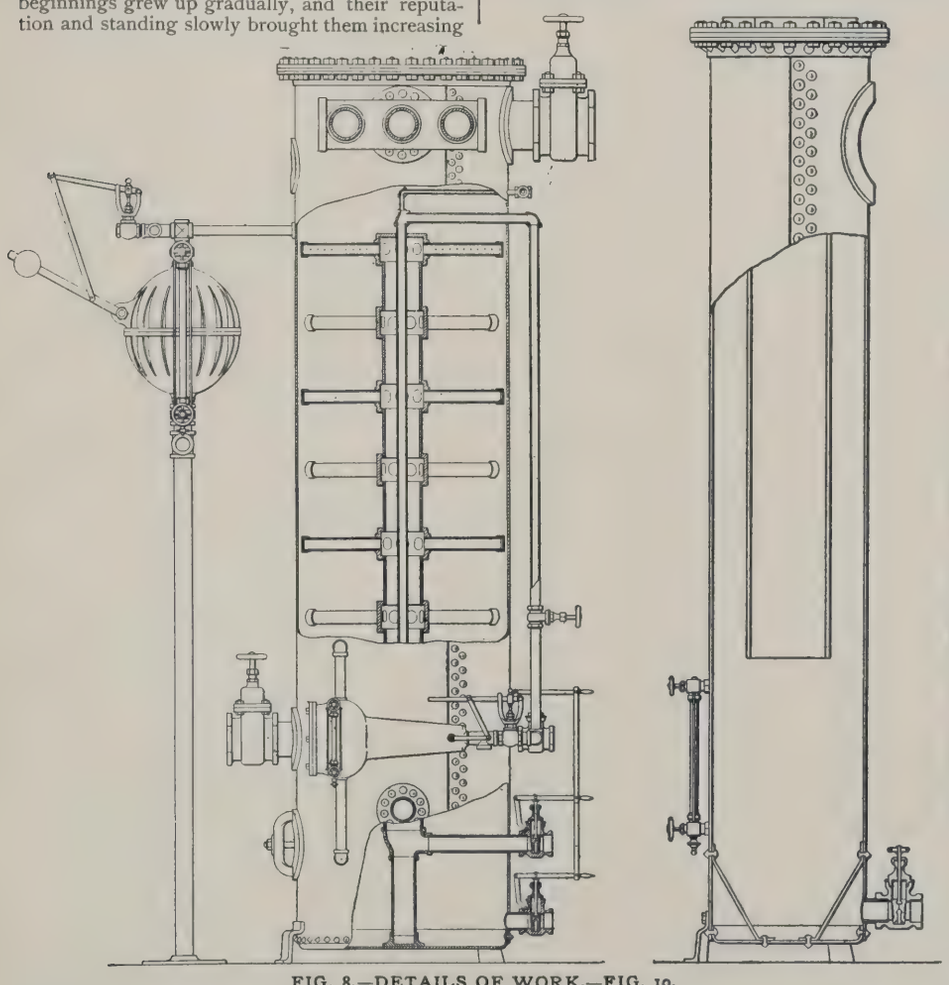


FIG. 8.—DETAILS OF WORK.—FIG. 10.

In the constant effort of mankind to get the most and the best of work at the least cost, there goes on a continual adjustment and struggle, and getting the order is the fore-front of the struggle. To get the order at a price that will yield a profit is that nice adjustment of means to ends that is so necessary for success. There have been magnetic men, real wonders at securing orders, but not profitable orders; it is needless to say that they retire from the struggle, and I doubt very much if they ever comprehend why. Meteoric solicitors easily convince themselves that the house was too slow for them, and that the reason money was not made on their work was no fault of theirs.

The slow, conservative house is probably at a bigger disadvantage to-day than ever before, but are there any such houses? We never come in competition with any house that does not seem a little too fast for us; or we are afraid they will get too fast. The slow, conservative house that would only take work where it showed a good profit belongs to the past. The effort to-day is to see how little profit will do, and this is the condition of all modern business, and is perfectly natural, and need not be deplored. Would it be desirable to have it otherwise? Suppose it were possible to limit competition, by agreement or otherwise, and to raise the average of price for work and the average of profit, what would be the result? As soon as there would be the least excess of profit in our business, men of enterprise would embark in it, increasing competition, with the result that prices would decline below the normal, probably as much as they had been raised above it.

I know this is mere doctrinarianism and not worthy the attention of practical men, but it might be true nevertheless, that is, relatively true to our present arrangement of society, and to our particular business. If it is true, any arrangement to raise prices would prove a failure, as the check to-day to there not being twice as many steam fitters as there are, is the fact that there is not profit enough in the business to attract men of enterprise to overcome the difficulty of getting into it. I have taken some trouble to show that I believe there is a natural check to anything but a natural profit, and I hope I have not entirely failed. It is of course the greatest of trade evils that we cannot make a fair profit, and the reason we cannot make a fair profit is because of a fierce competition for work, and the cause of fierce competition and consequent low prices is soliciting for work. Then let us agree to stop soliciting. This is absurd on its face. You may agree to anything, but the public won't agree, and the man of enterprise won't agree. If it were possible to agree it would not be desirable.

The correcting of so-called trade evils sometimes takes the form of substituting a new evil for an old one. The proper attitude is one of indifference to good and evil in business. There are mighty forces working, of which we are the atoms. What changes they may bring forth, slowly and laboriously, we cannot tell, but one thing you can be sure of, that makeshifts that do about as much harm as good, as most of the efforts at trade regulation really do, are not what is wanted, and are not what the future will bring forth. Let the solicitor and all other new forces work away; they all work for good in the end; not perhaps for the individual good, but let us hope the general good. No man knows whom he is working for. We are all working for others, and what may be for our selfish interests to-day may be against our selfish interests to-morrow.

VARIOUS reagents have been proposed as indicators of the presence of carbon dioxide in the contaminated air of a room, such as may be due to the imperfect combustion of gas or the use of a closed heating stove, etc. Haberman has demonstrated that cuprous chloride constitutes an excellent medium for the quantitative determination of carbon dioxide in air; and he has designed a form of apparatus for using it for the purpose. Chloride of palladium has also been recently indicated as an excellent reagent for the same object. If shaken up with air containing carbon dioxide, the latter gas reduces the palladium salt; and the result is a dark brown precipitate. The last suggestion to the same effect is to use ammoniacal nitrate of silver, which is very simply prepared by adding ammonia to a solution of the nitrate until only a small proportion of the oxide of silver remains undissolved; the fluid being then filtered and kept for use in a well-stoppered bottle. It remains without alteration for many months, even though exposed to direct sunlight. A sample of suspected air shaken up with this preparation gives a distinct brown coloration, if only one tenth of 1 per cent of carbonic oxide is present; the color deepening with an increase in the proportion of the gas, until with about 5 per cent brown clouds appear, and 10 per cent gives a brown precipitate. Pure air treated in the same way does not give the slightest coloration.

LETTERS FROM PRACTICAL MEN.

Correspondence from practical men upon topics of interest relating to Heating, Ventilating, and kindred subjects, will find a place in this department. The editors, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

Nature of the Williames Invention in Relation to Steam Heating.

As there has been considerable controversy regarding the patents of the Williames' vacuum system of steam heating, the writer would like to submit the main points of the argument which was made before the United States District Court, Southern District of New York, by F. H. Betts, the attorney of N. W. Williames, Nov. 1, 1889, believing that your readers will be much interested. It will be seen by a careful perusal of this argument that any system not having to maintain a vacuum at the tail end of it is *not* an infringement on the Williames system. The argument is as follows:

"Now, what was the Williames invention? Like all other inventions, it was founded on the discovery of something—on the finding out, appreciation, and putting into practice of something which, if it be a new invention, had not been discovered or observed before.

"This invention of Mr. Williames was founded, broadly speaking, upon the discovery that the principle of suction, continuously sustained, could be made an efficient and operative cause of the circulation of steam through a steam heating system, with its well-known complicated ramifications through a building."*

"That, broadly speaking, is the idea that underlies the invention.

"That it was not an obvious idea I shall show later on by citations from the evidence.

"He made another discovery, supplemental to that, and that was this: that he could not only apply the principle of suction, continuously maintained, at the tail end of a closed system, but that he could also apply that principle of suction even when there was an opening to the air at the entrance of the heating system, and that circulation could even then be effectively maintained by suction, and under such conditions that there would be no back pressure on the engine (if an engine was used in connection with the system, and was the source of steam supply). In other words, his two discoveries were that he could not only circulate efficiently by continously maintaining a vacuum at the tail end of his system, and could so circulate steam efficiently through the well-known complicated heating apparatus of buildings, but that he could do so even with an open exhaust pipe, and with a perfectly free access to the air from the exhaust and engine, and could thereby obtain additional advantages.

"He has claimed in the seventh claim of his patent, broadly, the apparatus which operates by creating, securing, and maintaining a vacuum at the tail end of the heating system, as the efficient and operative cause of the circulation of steam through a building: and he has claimed in other claims, notably in the first and second, the apparatus and system of circulation in connection with an open exhaust pipe, by which all back pressure on the engine can be relieved.

"The second invention is clearly patentable in addition to and as an advance upon the first or more general conception.

"Now, whether this was a discovery or whether it was already, and always had been, perfectly obvious, we shall consider more fully in a few moments.

"The operation of this discovery in practice depended, however, upon the devising means by Mr. Williames (or by whoever did it first) of producing and maintaining a vacuum at the tail end of the heating system.

"I say producing and maintaining a vacuum, for the patent says that with very great clearness. It says, in the preamble, that the outlet or bleeder pipesrun to a tank or hot well 'in which a partial vacuum is maintained.' Then it says that the operation of the system is as follows: 'The engine being in motion causes a partial vacuum to be maintained in the hot well.' And in the first claim expressly says that the bleeder pipe opens at the bottom into a hot well 'in which a partial vacuum is maintained.'

"And, even if that word 'maintained' had not been three times used as defining the mode of operation of the system, it is perfectly obvious that the patentee did not mean merely accidentally or temporarily or for a few moments to create a vacuum which should immediately disappear, but that his whole system depends upon the maintenance of a continuous vacuum or partial vacuum at the tail end of the system, which should operate to cause a continuous circulation of steam through the system." J. C. CRAIG.

*It is evident both from the testimony and from consideration of the difficulties and resistance to be overcome, that it was by no means obvious that the creation of a partial vacuum at the tail end of a steam heater could be made the effective cause of adequate or practical circulation; much less was it obvious that any advantages could be secured by such a system of operation.

Comments on the Papers of Messrs. Nesbit, Bates, and Walworth.

The three gentlemen who read their papers at the recent Master Steam Fitters' Convention, in the order I have given them above, have English names, but are, I think, of decidedly different types. Mr. Nesbitt, I should say, is a Yorkshire Celt, or very largely so, or perhaps Anglo-Irish or Anglo-Scotch. Mr. Bates, I should say, is almost pure Saxon, a splendid representative of that type, and worthy to represent Athelstane and Harold; while Mr. Walworth I would class as an excellent type of the present-day American,—more strictly American than New-England American. Unlike the others, I should say the Norman strain predominated in him, as it largely does, I believe, in the average Anglo-American, particularly if he be of nervous temperament.

Mr. Nesbit's paper was exceedingly interesting to me in many ways. As a lesson in present-day English practice its value is high. It will probably be denied in some quarters that Ashwell and Nesbit's practice is truly representative of Great Britain, and I am afraid Captain Galton, or rather Sir Douglas Galton, would be much amused by the statement that there was a revolution in English practice ten years ago. I know that I looked up the article on heating in the Encyclopedia Britannica after getting home on the day that I heard the paper read, and in that standard authority Captain Galton, who contrbiuted the article, seems to be in total ignorance of the fact of an impending or accomplished revolution in the art with which his name has been so long associated. The plans exhibited by Mr. Nesbit showed the thorough character of English workmanship,—something, I think, it will take us many years yet to learn. Our working with half-made plans, as we often do, would disgust an Englishman. But outside of that, I think, we have nothing much to learn from England or France. The truth is, that as England is far in advance of the world in marine engineering, we are far in advance of the world in heating and ventilation, and for the same reason. England is ahead in marine engineering because the conditions there are favorable. Great Britain practically builds all the ships of the world, and those who require ships and those who build them have their respective talents carried to greatest perfection by greatest practice. Our climatic conditions and widely distributed wealth have made extensive heating and ventilating a necessity of our civilization, and we are undoubtedly ahead of the world at present. I have no doubt that in northern China, where they have a brick or metal shod wooden box, on which they eat, sit, and sleep, and in the fire-box of which they burn a little refuse, they are really farther advanced in domestic heating than the inhabitants of the British Islands. For, taking it generally, the grate fire is the heat of both high and low throughout Great Britain. I can speak positively for Ireland.

Mr. Nesbit's direct radiator would never do here. We want no packing; we prefer screw joints. Outside of the peculiar diaphragm bolt arrangement, his is the Perfection radiator, which in its turn was the Detroit, ornamented, and that in its turn was the Belfield or Reed without the base. Mr. Nesbit would have done well to imitate the Perfection, for with their limited experience on the other side they can never hope to keep abreast of the times in the evolution of heating apparatus. The indirect radiator which he shows I should judge was our old friend of Buffalo, the Excelsior.

I am writing this at home, and I have not the paper near me for reference, and as I am writing from memory, I may do Mr. Nesbit an injustice, but I certainly do not mean to do so. I think he deserves the greatest credit for coming over here and presenting his work to us for criticism—

"Bearding the lion in his den,
The Douglas in his hall."

When he was saying they had one job working at 40 pounds, I could not help wondering if they were troubled with leaky valves at that pressure, and if they still used the homely valves I see advertised in Engineering, along with cast-iron pipe and its horrible and innumerable flanges. Their practice in boilers I think is awfully out of date, but I would be the last in the world to ask them to change. The conservative classes of society have the giving out of most contracts there as well as here, and the artist or artisan must change his methods slowly, so as not to shock them.

Mr. Bates's paper, like everything he writes, was magnificent. His paper on exhaust heating read some years ago, covered the whole subject, and this paper on radiation does the same. I took up my scrap-book, in which I paste everything in regard to radiation, and went over all the articles, some of them very good ones; but Mr. Bates's papers supplements them all. It leaves so much poor, sickly theorizing on proportioning radiating surface out in the cold, and demonstrates very clearly that the pat rules used by architects are of very little value. Steam fitters, I think, generally have always depended on individual judgment more than mere rule. His remarks on his own boiler were very good. I was told some time ago by Mr. Lawler, of Scranton, that he has used the Bates boiler for both hot water and steam for the last ten years, and that it has always given him perfect satisfaction; particularly on hot water, which rather surprises me, because I have always preferred cast iron for hot water. I was astonished that he should use a combination apparatus for both steam and water, as I have always regarded him as very orthodox, but there is probably more good in the combination than is dreamt of in my philosophy. I always regarded it as a first-class humbug, and would as soon think of advising a man to put it in as of advising him to drown himself.

Mr. Walworth's paper on boilers covered and exhausted the subject. It was most thorough in every respect. It loses half its force in print. It was a treat to hear it read. I had no idea before that the house boiler was so formidable or important an article. Mr. Walworth seems to favor the Field drop tube boiler. Belfield of Philadelphia made this boiler 25 years ago, and I would like to know why he abandoned it. It has been tried by a great many at various times, but none of them seemed to have as much success as those who are making that type now.

A great many of the boilers given in Mr. Walworth's list are practically obsolete, their makers either going out of business or making different types. There are also some mistakes in the tables, which could hardly be avoided; for instance, the well known Bronson boiler, made by the Weston Engine Co., is classed as a fire-tube, when it should be classed as a vertical water-tube. The enormous variety of these small boilers is staggering; and the fact that they all, every one of them, have serious faults (I make no exceptions), and that it is impossible to cure these faults without introducing others just as bad, gives us pause, and makes us think that domestic heating problems are not so insignificant after all. It was a pity that we could not have had a few foremen steam-fitters and superintendents and a number of the boiler designers discuss this paper on boilers, and get their individual opinion. There would have been variety enough.

With all the patent boilers on the market it is strange how New York city sticks to the old, plain, vertical tubular set in brick work, or the horizontal ditto, generally without shaking grates. At least ten well-known New York concerns put in these old-style types wherever they can, which means at least that 75 per cent of their work is put in with these boilers. It speaks well for the vertical and horizontal tubular boilers, but their day is over. The new school of steam-fitters don't like them, and don't want them, and in a little while we will see them no more; and like the buffalo, they will only be interesting as something that is past and gone forever. The boiler specialist has come to stay, and we all must adjust ourselves to the new condition.

I was rather unfavorably surprised by the appearance of the "standard" flanges, and made up my mind that if those shown were fair samples, it would be some time before they would be adopted. It was really absurd to take sides on

that question. The manufacturers have most at stake, and I hope a fair compromise will result from their conference. The reason we have standard pipe (have we standard pipe?), standard threads, and standard fittings is entirely due to the manufacturers of these articles approximating their practice. It will be the same in regard to flanges; and that all concerns should be compelled to adopt the standard that one enterprising concern had already adopted is really absurd, and I am sorry there should have been so much feeling shown over the matter. The masterly presentation of the manufacturers' side by Mr. Coppins, of the Walworth Company, was one of the best things of the convention. A little clear talk like that from manufacturers and jobbers would brush away many cobwebs.

There was one thing conclusively shown by this convention, and that was that engineers are in a decided minority. The majority are more anxious about getting work and money than about the mere art of heating. Imagine any other society in the world inviting men to give them the results of their thoughts, and one gentleman actually coming three thousand miles to do so, and then having a resolution passed that in future papers must only take ten minutes to read. We have lots of time for excursions, but only ten minutes to hear the results of your thoughts. The facts are that the majority of American heating and ventilating engineers are not members of the Master Steam and Hot Water Fitters' Association, and that a majority of the association are really business men only, and that these gentlemen cannot appreciate an engineer's feelings in regard to technical matters. It is a pity that there were not at least a thousand present to hear Mr. Nesbit's paper, and to intelligently discuss it, as English societies of engineers would discuss a paper presented to them by an American engineer of equal eminence. The technical side will have to come more to the front at national conventions, the business side being left to the locals, where it belongs, and the national convention be a grand interchange of views, where all designers, constructors, and engineers interested in heating and ventilating can exchange views for the purpose of elevating and ennobling the art which gives them their daily bread. H. J. BARRON.

Ventilation.

Having read in your valuable paper numerous articles on what is considered a question of great importance, I would like to say a few words relating to the subject. A great many writers seem to know what ought to be done, but as yet I have failed to find any expression as to how it should be done; and as nearly all may have a way of their own, they seem to refrain from telling what might be a great benefit to humanity.

Air, the most important element for all living creatures and things both animal and vegetable, is in abundance and in purity if the inventions of men would only leave it so. It is the only thing we have to resort to for the promotion of health and happiness The damaging properties of vitiated air are not discernible to the human eye although they are many. The great cry of the damaging effects of carbonic acid by so many of our hygienic experts would lead one to believe that it was dangerous to stroll out into the backyards or the cellars of our residences. I am willing to admit that carbonic acid is not the best thing, but I find that the company it keeps is much worse than the carbonic acid itself. There is no system of ventilation that can be applied that will dissolve the disease microbes of any of the contagious diseases. The minuteness of the particles are such that many thousand can comfortably remain in a cubic inch of air without being compressed, and the only improvement that we may expect to make is to reduce the number per cubic foot. Therefore large volumes of air passed into and out of rooms, without producing currents, will be the most popular. Calculating two thousand cubic feet per hour of air for each pupil in a room of fifty pupils, which must require one hundred thousand feet, the system of ventilation must be well constructed in order to prevent currents, and by introducing this amount, the percentage of disease microbes can be so reduced that the danger will be lessened to such an extent that contagious diseases will not be liable to spread very rapidly.

By introducing the air at the top of the room the constant downward pressure of the air will compel the disease microbes to seek the floor and keep them below the breath line when persons are sitting, and the large volume of incoming and outgoing air will prevent the poisons from rising; but the important question is, What becomes of our disease-propagating air after it leaves the top of our vent shafts, which must be used to convey the vitiated air to the outside of the buildings, where it must descend? As we all cannot be on the inside of the buildings, persons may be liable to come in contact with the disease-conveying atmosphere after it has been carried into, up, and out of the vent shafts. Who has, or has there ever been any device in which the vitiated air is passed through fire or heat of high enough temperature to kill and destroy the disease-producing matter? It will have to be acknowledged that heat is the only element that will destroy them, as cold matter or disinfectants have no effect on them, and unless destroyed they must perish by natural death, which, it has been ascertained, requires at least thirty days. It must be confessed that distributing the inside air through the outside air lessens the danger, but danger must and does certainly exist. Now, when some genius invents some plan by which the vitiated air of our building can be passed through fire, or through the heat of fire of a temperature high enough to destroy the disease germs, then we can say that our systems are perfect, and not until then. Has this been done, or can it be done?

One great mistake I find that our most prominent heating and ventilating engineers make is the placing of dangerous concerns called safety dry closets, for the purpose of taking care of the excrement of our schools, and in some cases they are connected with the system of ventilation. It must be conceded that ninety per cent of the dangers are contained in the human excreta, and any form of dry closet connected with or using air in any form to try to take care of this particular material can only be classed as disease incubators. Some of our heating firms have adopted dry closets, and take cold air from an outside window, on the same principle as supplying a heating furnace with air for warming purposes. This plan I do not think any better than that where the closet is connected with the system of ventilation for the passage of the air over the surface of the excreta and up the flue or closet vent into the outside air. It is certainly most dangerous and damaging to the community in which such death traps are placed. Again, water closets are equally dangerous for more than one reason, viz., sewer gases contaminating the waters of streams and polluting the soil where and from which dangerous gases are liable to and certainly do arise. Being called upon to examine and pass on the merits and demerits of different systems where disputes have arisen between boards of education and contracting, heating, and ventilating firms, I don't think I ever found more than 5 per cent of the buildings inhabitable with any degree of safety, and yet people will wonder at the large number of our pale, sickly school children. What shall we charge it to? Ignorance, neglect, or penuriousness in our boards of education, to expend sufficient money to properly equip our buildings, or to our theoretical more than practical heating and ventilating engineers? F. G. WARD.

Summer and Winter Ventilation.

W. D. Dickson, concluding his article on Summer and Winter Ventilation in Schools in the April number, says: "If heating and ventilating engineers will turn their attention to winter ventilation, and let summer ventilation take care of itself, it will then be time enough, when the problem of winter ventilation is solved, to take up summer ventilation, but the two do not work successfully under the same treatment."

At the present time there are heating and ventilating apparatus in use in buildings of various kinds, giving more or less satisfaction at all seasons of the year. The problem of summer ventilation and cooling by means of an apparatus designed principally for use in winter has been successfully solved. Each case, however, presents new difficulties and a new problem to the engineer, and consequently it is impossible to find a complete system which would answer in every instance. As to school-houses, it may be best to let summer ventilation take care of itself, because most of them are closed at a time of the year when ventilation through windows gives no relief and when artificial cooling would be desirable. In hospitals, asylums, meeting halls, places of amusement, restaurants, and in fact anywhere that people meet and are compelled to stay indoors on a warm day or night, it is the duty of the owner and the interest of a business man to provide for a generous supply of pure, dry, and cool air. Good air supply is as necessary for health as is pure water and food, and yet we often breathe foul air in places where every other comfort can be had. In some instances it may be the increased cost of installation, but very often it is only ignorance which can account for this lack of real ventilation.

A complete heating and ventilating apparatus which may be used at all times should comprise the following features. Fresh air from out-of-doors should be taken from a source known to be most pure under the existing circumstances. In smoky cities or in dusty places a screening chamber should be provided, with surfaces of cheese cloth or special filter cloth, which will retain the smallest bodies floating in the air, and also keep out disease germs to some degree. There should be a fan blower, designed to deliver the proper amount of air to dilute the impure atmosphere in a given space to a certain acceptable degree. This degree can be fixed by measuring the percentage of carbonic acid in the room to be ventilated, which percentage gives the means to determine the number of cubic feet of air to be introduced in a given time.

With summer ventilation in view it is better to have a blower of ample capacity to supply as much air as can be introduced into the room without causing objectionable drafts. This amount of air will vary in each particular case, according to the shape of the room and the manner of introducing the air. In one instance the volume of air contained in one room may be exchanged ten times per hour without trouble, while in other cases a change of air every ten minutes, which is six times per hour, may be found objectionable. The blower should also be capable of overcoming any resistances through screens, coils, flues, etc., the air may have to pass, while actually delivering the desired air volume. The fan blower may be driven by a steam engine, electric motor, or any other kind of reliable motor. In buildings where steam boilers are not running all the year round, electric motors, taking the current from street mains, will be found very serviceable.

Further, the air should pass a series of coils, properly arranged and spaced. One part of these may be used in winter for heating by steam or hot water. Another portion should be designed for circulation or cool water either from city mains or any other source. These water coils are intended to be of service in hot and sultry days, when the relative humidity of the atmosphere is very high. A slight cooling effected while passing through these coils will bring about a condensation of the moisture contained in the air and thus make it dry and less oppressive. It is not intended, and neither is it desirable, to bring the temperature down to a certain degree, say 70 degrees F. The best effects can be obtained by this simple drying process, with incidental cooling to a few degrees below the outside temperature.

It may be mentioned here that the air supply can be subjected to other treatment, as the case may require. Certain places require moistening apparatus, or disinfection, perfuming, etc., which may be successfully combined with a heating and ventilating apparatus. From these appliances the air generally passes to a system of distributing ducts, leading to the different rooms. This duct system may be so arranged as to make the amount of air supplied to any room independent of temperature. In other words, any room should have provision to regulate the temperature at a constant air supply, or for heating purposes it can be arranged to keep an even temperature by varying the volume of air.

The proper location for air registers is overhead, about eight feet from floor or higher. In some cases the air may be introduced through openings in the ceiling. The escapes or eventually the exhaust openings should be near the floor level, in the inside walls if possible. Architects should always consult a heating engineer when laying out the wall flues.

In winter time, when windows and doors generally are closed, it is easy to get good circulation of air by artificial means. In summer the distribution of air is more difficult, but it can be obtained with more or less perfection if windows are kept closed or open. In the first case the air is forced to circulate the same way as in winter; in the latter case, fresh and cool air, introduced overhead, will naturally settle down to the floor, mix up with the foul air, and escape through windows and doors. If properly introduced it will come in contact with the occupants of the room and bring relief to suffering humanity. K. MEIER.

NEWS AND NOTES.

Large Buildings.

Newark, N. J.—City will issue $300 000 in bonds for a new city hospital.

Fort Niagara (Lockport), N. Y.—A new administration building is to be erected, to cost $25,000.

Memphis, Tenn.—It is proposed to erect a $25,000 asylum for St. Peter's Institution. Address E. C. La Hache.

Princess Anne, Ind.—Authority has been given Somerset County to issue $20,000 in county bonds for the erection of a new court house.

Toronto, Canada.—City Council is now considering the selection of a site for a consumption hospital, to cost $50,000.

New York, N. Y.—James Everard has had plans drawn for a 12-story brick warehouse to be located at the N. E. corner of Washington and 10th streets, to cost $250,000.

Leonard, Texas —Plans and specifications are wanted for a $25 000 building to be erected by the Leonard Collegiate Institute. Address D. H. Dodson.

Norristown, Pa —The Town Council of Norristown is inviting proposals for the erection of a $50,000 borough building and market.

Philadelphia, Pa.—$28,000 has been appropriated for a new police and patrol station, to be built at Fairmount avenue and Mintzer street.

Philadelphia, Pa.—An appropriation of $40,500 has been made to the Departmen of Charities and Correction for a home for nurses of the Philadelphia Hospital.

Winnipeg, Man.—Sealed proposals have been received for the construction of a hot water heating apparatus at the Regina Association public building.

New York, N. Y.—The Peter Cooper estate will erect for the American Lithographic Company an eight-story fire-proof building, on 4th avenue, between E. 27th and 28th streets, to cost about $500 000.

Buffalo, N. Y.—Henry Schafer's Sons have drawn plans for a stone, brick, and iron bank building, 38 by 60 by 42 feet, on the east side of Main street for the Bank of Commerce. Estimated cost, $53,000.

Lowell, Mass,—Last year the legislature ordered the Middlesex County Commissioners to build a new court house in Lowell. The commissioners will expend $150,000 for building the new structure.

Syracuse, N. Y.—W. H. Wilkinson has completed the plans for the Women's and Children's Hospital in West Genesee street. The cost will be $70,000. The building will be of vitrified brick and will be fire proof.

New York City.—The Building Committee of the Clearing House Association have awarded the contract of building the new association building in Cedar street to Architect Cyrus L. W. Eidlitz. whose bid was $145.000.

Philadelphia, Pa.—Extensive improvements are soon to be made to the Lafayette Hotel. About $50,000 is to be spent on the work. The front entrance and lobby are to be enlarged, and considerable interior work is to be done.

Canandaigua, N. Y.—The Board of Supervisors of Ontario County at an adjourned meeting held last week appropriated $25,000 to build a new jail and sheriff's residence at Canandaigua.

New York City.—The approved plans for the Sunday school building of the Second Collegiate Reformed Church, 123rd street and Lenox avenue, are in the hands of the building committee and work will begin at once. Cost, $40,000.

Worcester, Mass.—Plans have been completed by Messrs. Barker & Nourse for a three-story block, containing two stores and six tenements, to be built by Alderman Geo. W. Coombs, on Main street, between Kilby and Gardiner streets. Cost, about $20,000.

Buffalo, N. Y.—There is to be a new "White Building" It will be erected by James P. White at Main and Allen streets, with a frontage of 131 feet on the former street. It will be an apartment house, four stories high, with ornamental facades, and will cost about $40,000.

Jamaica Plain (Boston), Mass.—It is reported that a large brewery plant will be established on Germania street and Brookside avenue, Jamaica Plain, a tract of land containing about 43,000 square feet having been purchased for the purpose. It is said that $250,000 will be expended by the projectors.

Rochester, N. Y.—Messrs Nolan & Stern, architects, have drawn plans for a commercial building to be erected on lot on North St. Paul street. The block will be 7 stories high, and will cost about $35,000, exclusive of the land. Contracts have been let, and the block will probably be finished in February.

St. Paul, Minn.—The Board of State Capitol Commissioners will receive prior to September 11th, 1894, designs for a new capitol building for the State of Minnesota. The entire cost of the building complete, including heating, ventilating, and lighting apparatus and fixtures, must not exceed the sum of $1,500,000. Four premiums of $500 each will be awarded. W. H. Lamberton, clerk of commissioners.

New York, N. Y —The Fidelity & Casuality Co. have filed their plans in the Building Department for their new 11-story office building to be erected on the north side of Cedar street, between Temple street and Trinity Place. Will cost $250.000. A 13-story brick and stone office building is to be erected at No. 66 Maiden Lane, by the John Wold Estate, to cost $100,000. John T. Williams will build a nine-story brick and stone warehouse at the N. E. corner of Broome and Mercer streets, to cost $75,000.

Washington, D. C.—T. F. Schneider, architect, 18th and Q streets, has drawn plans for a five-story hotel building to be located on the corner of 7th and G streets for Judge A. H. Lowery. An iron staircase and a hydraulic elevator will run to the roof, which will be finished as a garden. Will have a steam heating plant. Estimated cost, $130,000. Architect C W. Summerville, Builder's Exchange, is engaged on a plan for an armory building for the District of Columbia National Guard. It will be a plain structure of brick, trimmed with stone, four stories, 122 by 147 feet, and will be heated by steam and lighted with electricity. Architect J. Palmer has drawn plans for the new Masonic Hall on the north side of Pennsylvania avenue, between 3rd and 4th streets, S.E. The building is to be 85 by 86, 50 feet high, and will cost $40,000.

Schools and Colleges.

Chester, Pa.—The Building Committee of the new Chester school board met June 21st, to discuss the plans and specifications for the New Central School on Broad street. Will cost $50,000. Especial attention will be paid to light and ventilation.

New York City.—A new public school building is to be erected on the east side of Edgecombe avenue near 140th street, to cost $221,700, and a similar building is to be erected at the corner of St. Nicholas avenue and 117th street. A five story brick and stone public school building is to be built at northeast corner of First avenue and Ninth street, to cost $90,000.

Woodside, L I.—The cornerstone of the Woodside public school building has been laid, to cost $30,000.

Jamaica Village, L I.—Jamaica Village has voted to issue $100,000 bonds to build three new school houses

Waycross, Pa —A $20,000 school house will be erected Architect, W. Chamberlam & Co.. Knoxville, Tenn.

Perrysburg, O.—The school board will erect a $30,000 school house this summer.

Providence, R. I.—The school committee wants a new school on Broad street, to cost at least $20,000.

Watertown, Mass.—A new brick school-house is to be built at Watertown, to cost $40,000.

Buffalo, N. Y.—The authorities of St. Josephs College are looking for a site on which to erect a new college building. The structure is to cost $100,000.

Guttenberg, N. J.—Architect Beyer has drawn plans for a new public school house at Guttenberg. The cost of the building is estimated at $20,000.

Pittsburg, Pa —The revised plans of Architect Stotz for 5th avenue school have been adopted. Cost of school $250,000.

Wooster, Mass.—City Council has decided to erect a school house on Darthmouth street, one on Abbott, and one on Upsala street. Each building will cost abont $20 000.

Glenson College, S C.—Plans have been prepared by Bruce & Morgan, Atlanta, Ga., for rebuilding the Glenson College; cost, $40,000. Proposals have been received by P H E. Sloan

Chicago, Ill.—501-13 Washburn avenue, owner, August Feidler, 73 City Hall; architect mason work let; cost, $60,000, 130 by 124, three stories high, architectural and galvanized iron work, steam heat, plumbing ventilators, etc.

St. Louis, Mo —N. S. McPherson, between Vandeventer and Sarah streets, St Louis public schools, 9th and Locust streets. A. H. Kirchner, 9th and Locust streets, architect. Contract not let. Cost $32,000, 108 by 78, two stories high, steam heat, gas fixtures, plumbing, etc.

Buffalo, N. Y.—City has accepted plans for following schools; At Guernsey and Hertle avenues, W. W. Johnson, architect; on Barry Place, Beebe & Sons, architects; Highland Park school, Main and Leroy avenues, Green & Hicks, architects; Each school house will probably have 16 rooms, and they will cost between $40,000 and $48,000 each.

BUSINESS NOTES.

Estimates for the work of constructing the new shop for the Sperl Heater Co. of Carbondale, Pa., have been asked.

One Hundred from Many Thousand comes to us from the Fuller & Warren Co., Troy, N. Y., being a few of the best testimonials as to the efficiency of their apparatus. They are sent free.

Thos. Hoey of East Boston, well known for years to the heating trade in the East, will hereafter act as New England representative of the Holland Radiator and Mfg. Co. Mr. Hoey will, as soon as arrangements are perfected, carry a stock of radiators.

Owing to the increased demand from the trade in the New England States, the Superior Furnace Co., of Little Falls, N. Y., have found it necessary to establish a New England agency with headquarters at 28 Union street, Boston, and have placed the same in charge of Mr. Henry A. Kelley, who has had a long experience and is well known to the New England trade. Mr. Kelley will prepare plans and specifications for dealers, and will call frequently on the trade. He will also be glad to have all interested in good heating appaatus call upon him when in Boston.

The Superior Stove and Furnace Co. of 94 Superior street, Cleveland, O., send us the following: "We desire to inform our friends and the citizens of Cleveland and vicinity that the Superior Stove and Furnace Co., has been incorporated under the laws of Ohio, for the purpose of transacting a general wholesale and retail business in the sale of superior stoves, furnaces, steel ranges, house furnishings, and kitchen ware, with office and salesroom as above indicated. To this end we have secured the general agency for the state of Ohio of the popular line of Superior furnaces, heaters and ranges manufactured by the Superior Furnace Co. of New York. Our equipment and facilities are first class, and we hold ourselves in readiness to prepare plans and specifications, submit estimates, close contracts and execute all work entrusted to us in a first-class manner. The names of the incorporators are given elsewhere.

The Stewart M'f'g Co. of 4 and 6 Avenue A, Newark, N. J., are manufacturing a line of gas heating stoves which have been very favorably commented on by their users. They have also just put on the market the Stewart water heater, which consists of a stand and jacket, the former of the standard height, and can be used under any sized boiler and in conjunction with or separate from a range and water back; requires no alterations of any plumbing work in use. With this gas standard danger or risk of a water back freezing can be obviated by using one burner turned low, which will keep the water hot. Thirty-five gallons can be heated to boiling point in two hours with thirty feet of gas, and then kept at boiling point with six feet of gas per hour and allow three gallons of boiling water to be drawn every hour of the year if needed. Send for catalogue of heaters, mentioning HEATING AND VENTILATION.

J. C. Henderson of Troy, N. Y., has a steam boiler which we noticed in the April issue of our journal, and which having been constructed after many years of practical experience in the construction and operation of all kinds of heating apparatus, is worthy of further mention. The fire pot is 21 inches deep, and is made hollow for the circulation of water, so that its whole surface surrounding the burning fuel absorbs directly by conduction a very large percentage of all the heat evolved, which is imparted to the water which circulates in it. This surface, coming into direct contact with the fuel at about 1000 degrees, conducts the heat at an enormous rate. The steam reservoir in the form of an inverted cone directly over the fire, absorbs a large amount of heat by direct radiation from the fire, the hot gases rising naturally from the fire surrounding the large and always available heating surface which its form provides, and then heat is absorbed, the vertical tubes through which the water circulates between the hollow fire box and the inverted cone absorb radient heat directly from the fire, and are large and always available surfaces for absorbing heat from the hot gases. Send for circulars.

Batt, Bonnell & Thompson have moved into a new store at 36 Dey street, New York, just below their old store. They will handle a fine line of supplies, including the well known Nelson valves.

The Howard Thermostat Co. of Syracuse, N. Y., will soon have ready for the market a new thermostat regulator designed to control the temperature of very large spaces, including churches, office buildings, etc,

The Howard Furnace Co. of Syracuse, N. Y., through their New York office, report increased business in combination hot water and hot air furnaces, and have lately been doing some fine work in Bridgeport and other places in Connecticut.

The New York office of the J. H. McLain Co. is well filled with visitors these days, and you will find D. R. McCallum on deck from 7.30 A. M. until late at night. The boilers are taking too, so much so, in fact, that the company are well pleased. "Placed an order for two yesterday," says Mac, and that's the way it goes.

The New York offices of Hart & Crouse, at 211 Water street, have been rearranged and the space over the main office has been partitioned off as a drafting room, where Mr. Mackay and his assistants can hold private consultations. Other improvements are under way and will be mentioned later.

The Presby Stove Lining Co. of Taunton, Mass., in addition to manufacturing fire brick and stove linings, make fire tiles, locomotive arches, gas retort settings, bakers' oven tile, boiler door arches and jambs, furnace-door tiles, and from patterns and drawings make any size fire brick or furnace tile, to order.

The Magee Furnace Co., through the New York office, have secured the contract for placing four No. 4 combination heaters in schools at Milville, N. J. They are also adding one more combination to the Vineland school. The last trip made through New Jersey by Mr. Sweeney, their New York manager, resulted very favorably for the company.

The forty-third meeting of the American Association for the Advancement of Science will be held in Brooklyn, N. Y., from August 16 to the 23. In connection with it will be held the first annual meeting of the Society for the Promotion of Engineering Education, meetings of the latter society being held on August 20, 21, 22, and 23 The headquarters for both societies will be the St George Hotel, Clark street, one block from Fulton. Section D (Mechanical Science and Engineering) of the association will hold its sessions in Room 33, third floor of the Polytechnic Institute, near City Hall square, on Thursday and Friday, August 16 and 17, and will probably conclude its work on the latter date. All railroads will issue tickets on the certificate plan, fare and one third for round trip.

In connection with the installation of the extensive system of heating and ventilation in the Scranton high school, for which Mr. Fred P. Smith, 605 Metropolitan Life Building, New York, was selected as consulting engineer, the following report of the action of the School Board of Control will undoubtedly be of interest:

Scranton, Pa., July 9, 1894.

THE HIGH SCHOOL COMMITTEE REPORT AS FOLLOWS:

Whereas, on or about the 12th day of February, 1894, Mr. Fred P. Smith, at that time vice-president and acting as manager of the Smith Heating & Ventilating Co. of Boston, Mass., submitted to this board a proposition to draw plans and specifications for the heating and ventilation of the new high school, and to furnish the necessary superintendence of the construction of said building with reference to the heating and ventilation of the same and of the introduction of the apparatus and system, and to give satisfactory bonds in the sum of $5,000 that the said system, when introduced, will secure the warranted results according to the highest standard of ventilation, upon a basis of not less than 30 cubic feet per pupil per minute, and to furnish manufactured articles necessary for the introduction of said system at a price less than the wholesale price of said articles; and

Whereas, the High School Committee of the Board of Control recommended the employment of Mr. Smith as the supervising engineer of the heating and ventilation of the said high school under the said proposition, which recommendation was adopted by the Board of Control, of which action the said Fred P. Smith had due notice; and

Whereas, since the said notice to the said Fred P. Smith, his relations with the Smith Heating & Ventilating Company have been entirely severed, and since the severance of said relations, the said Fred P. Smith has done and performed certain work in connection with the architects of the said high school building upon the plans and drawings and detailed drawings of the said high school, so far as the same relates to the system of heating and ventilation to be introduced therein; and

Whereas, no contract has ever been executed between this Board and either the Smith Heating & Ventilating Company or Mr. Fred P. Smith in relation to the introduction of the said system into the high school, nor in relation to the employment of the supervising engineer of said work; and

Whereas, a dispute has arisen between the said Fred P Smith on the one hand and the Smith Heating & Ventilating Company upon the other hand, as to which is entitled to have the contract with the Board of Control for the matters covered by the proposition herein mentioned; and

Whereas, the Board of Control deem that the proposition as submitted by Mr. Smith was mainly a proposition for personal superintendence and the preparations of plans, and the Smith Heating & Ventilating Company was not in any way named in the said proposition, and the said Fred P Smith was notified that the Board had adopted the recommendation of the High School Committee to employ him as supervising engineer, and relying upon said notice, he has gone on, and in connection with the architects of the high school performed certain work since the severance of his relations with the Smith Heating & Ventilating Company;

Now therefore, be it *Resolved*, by the Board of Control of the City of Scranton School District that the contract be executed with the said Fred P. Smith in accordance with terms satisfactory to the Board on condition that the said Fred P Smith give satisfactory bond as follows: (1), A bond in the sum of $5,000, with two good and sufficient sureties, conditioned upon the faithful performance of the contract and upon the satisfactory operation of the said system when it shall be introduced; and (2). A bond in the sum of $5,000 also, with two sureties, conditioned that the said Fred P Smith shall fully indemnify the Board of Control of and from any litigation, suits, charges, expenses, or costs in the matter arising out of any action which may hereafter be taken by the Smith Heating & Ventilating Company under the claim that they are entitled to receive the contract for the introduction of the said system into the high school building.

Geo. T. Barnes, Newburg, N Y., representing the Richmond Co.'s products, has issued an illustrated catalogue which is sent free to all.

Grassler & Gezelschap of 300 West Water street, Milwaukee, Wis , are among the many who have sent us catalogues illustrating and describing Richmond heaters.

Mr. Geo. H. Reynolds has resigned as the secretary of the M. S & H W. Fitters Association, after several years of hard work. His successor has not yet been appointed.

Genl. Manager C. F. Walther of the Niagara Radiator Co of Buffalo, N. Y., has been in New York for a few days arranging for the location of the company's office at this point

The headquarters of the executive committee of the Master Steam and Hot Water Fitters Association of the United States for the ensuing year will be at Room 732, Cable Building, New York. Address J. L. Wells, chairman executive committee.

Kennedy & Sullivan, Holyoke, Mass., are now the agents of the Richmond Stove Co.in that city, and have just issued a catalogue, illustrated with many half-tone cuts, showing residences where this apparatus has gone in. These catalogues are mailed free.

W. A. Russell will hereafter represent the Niagara Radiator Co. and the Detroit Lubricator Co. in New York, with offices on Centre street. Mr. Russell has many friends, who will be glad to see him so well located, and who no doubt will do all they can to help him out.

The Superior Furnace Co. of Little Falls, N. Y., by reason of the increasing demand for the popular line of Superior steel furnaces and heaters, have been obliged to put on additional help, and are running their foundry and shops full time. The prospects bid fair for a good fall trade.

Fuller & Warren Co. of Troy, N. Y., send us their special price list for 1894 on ranges, cooking and heating stoves. This catalogue is, as is everything sent out by this company, most complete. Not only are pictures of the apparatus shown, but the interior work is made plain, and cuts showing exactly how the grates, dampers, etc., work are given. A complete telegraphic code makes this a book that every dealer should have in stock. Send for one, mentioning H. & V.

Ventilate your attics and get relief from the excessive and exhausting heat by using the Globe Ventilators, says the Globe Ventilator Co. of Troy, N. Y. These ventilators open a wide avenue of escape from the unhealthy condition of close, stuffy, and superheated residences, and are very efficacious in rendering cool and comfortable churches and halls, lodge rooms, etc. Owners of summer cottages will find great benefit in using the Globe, for not only will it be greatly appreciated by the occupants from June to October, but when the house is closed, it will keep the rooms from becoming mouldy or musty, so that when opened in spring time the rooms will be found dry and sweet.

Heating Apparatus comes to us from Giblin & Co., Utica, N. Y., with an illustrated description of steam, hot water, and combination heaters manufactured by them. After giving the terms, shipments, etc., steam heating, the good and bad results, and the causes, follow. A new heater, the Standard, Jr., for hot water (illustrated in our June issue) is shown, which has many strong points; the Standard steam and hot water combinations also deserve especial notice. General directions, directions for operating, size of hot water radiator connections, greenhouse heating, with tables and many testimonials, complete a well-printed and valuable book which can be had by reliable dealers free.

Health and Comfort in the Home Circle has just been issued by Thomas W. Wethereds' Sons, manufacturers of hot water heaters, 244 Canal street, New York. The company say in issuing this new edition of their catalogue, that they take this opportunity to thank their numerous friends for favors extended, and hope by strict attention and promptness to merit a continuance of them. The catalogue contains many illustrations showing cuts of different sized hot water heaters, with description of boilers and interior arrangements, illustrations of rocking and dumping grates, made especially for and adapted to all their boilers, a page on laundry stoves, a page on heating of dwellings by hot water, illustrated; proportionate amount of radiating surface to space to be heated; a few points for fitters, useful information and directions for setting the Wethereds' boilers. This book will be sent free by mentioning H. & V.

A Golden Jubilee—1844–1894—comes to us from the Anshutz–Bradberry Co., Pittsburg, Pa. In 1792 George Anshutz came to Pittsburg and erected the first blast furnace west of the Allegheny mountains. It was located at Two Mile Run, now Shadyside. Fifty years later Henry Anshutz, a nephew of the blast furnace man, together with Christian and Philip Shaver, founded the firm that has developed into the Anshutz–Bradberry Co. The start was small and unpretentious, only four or five men being employed, but the motto "Only the Best" soon gave them prestige, and their trade increased rapidly. In 1856 Henry Anshutz became sole owner of the business, and a few years later his two sons, C. W. and John H., were taken into the firm, which then became H. Anshutz & Sons. In 1872 John H. died, and the firm resolved itself into H. Anshutz & Son. On January 1st, 1879, Wm. T. Bradberry was admitted to the firm, and the name was again changed to H. Anshutz & Co. Henry Anshutz retired in 1866, and his two sons, Frank and Lewis A., were taken in as partners under the title of Anshutz, Bradberry & Co., on Oct. 9, 1887. Henry Anshutz, the founder, died, after having lived to see the business he had started in a small way grow to one of the largest of its kind in the country. In 1892 Wm. McCullough and L. M. Armor were admitted as partners, and the firm was incorporated as the Anshutz–Bradberry Co. In 1872 the foundry was removed from its original location on the corner of Ohio and North streets, Allegheny, to very much more commodious quarters on River avenue, where it remained until 1888, when the present extensive works on Preble avenue were erected. The buildings are located on a plot of ground containing 2½ acres, having a frontage on Preble avenue of 200 feet. The main building is of brick, five stories high, the foundry in the rear being 100 feet square. Besides these there are stables, flask sheds, engine room, and cleaning and polishing rooms, all thoroughly equipped with the most modern appliances. In the main building, besides the well-appointed offices, are the pattern shop, the tin shop, the moulding room, and commodious storage rooms. The establishment has a capacity of ten thousand stoves and ranges a year, and gives employment to over 100 workmen. If you want to know more about Tremont stoves and warm air furnaces send for catalogue, mentioning H. & V.

Exeter boilers and radiators go into the new Hotel McKinley, Boston, the Saco House, Saco, Me., and the Biddeford House, Biddeford, Me.

It is reported that Herbert E. Jones, formerly of the Boston office of the American Boiler Co., will represent the Ideal Boiler Co. in New England hereafter.

The firm of Geo. H. Bell & Co. was merged into a stock company on May 27th. The corporation will be in such shape for the future as will facilitate the prompt execution of all orders. The "Peerless" heater has been well received, and the company report increased demand.

Messrs. E. V. Atkins' Sons, 235 Lake street, Chicago, the authorized agents for the sale of Superior furnaces and heaters in Chicago and vicinity, report a satisfactory trade in their new combination steam and warm air heater, which is meeting with universal satisfaction wherever introduced.

The following agents of the Richmond Stove Co. of Norwich, Conn , have contracts on hand for setting heaters: Leonard Mallary, New London, Conn ; Higgins & Co , 379 Lexington avenue, New York city; R E. Harmon, Amesbury, Mass.; Allan Block, St Paul, Minn.

The Gorton & Lidgerwood Co., 96 Liberty street, New York, have just issued a new edition of "Modern House Heating," well illustrated with several half-tone plates showing the Gorton boiler as used in heating large buildings. The book is altogether a very creditable publication, and should be in the hands of every steam fitter, architect, and builder. Say you saw it in H. & V. and get a copy.

The Walworth Mfg. Co. of Boston, issue a neat little folder entitled Diverse Radiator Air Valves, on one side of which the air valves manufactured by them are shown, with prices; the other side contains only a picture of water, a plank, and several figures made up of different shapes of air valves, with the appropriate heading, Radiator Air Valves' "Divers," Do you catch on? It not send for a folder.

What People say about the "Royal" Steam and Hot Water Heaters comes to us from Hart & Crouse. The four-page circular is crowded with only the very best testimonials of selected public buildings, private residences, and greenhouses, and from the character of the trade is as effective as if the company had issued several hundred more which, judging from reports of their sales, they could have easily done.

Col. Mowry of Norwich, Conn., of "Page" and "Cataract" fame, was at the late Steam Fitters' Convention. We missed saying so because the Colonel didn't come around and register, but he says he won't lay it up against us if we just say that he feels much gratified that the trade has taken so kindly to his boilers, and that the work they have been doing for the last few years have established them as heaters which waste no coal and cost nothing for repairs, their ease of management leaving nothing to be desired.

We are in receipt of a test, made by R Grimshaw, of Dixon's waterproof graphite grease for lubricating pulley blocks at the U. S. Navy Yard, Brooklyn, in collaboration with Lieut. John A Bell of the equipment bureau. The tests were for the purpose of determining the percentage of power wasted by unlubricated blocks The results show that the use of the above mentioned grease reduced the friction, in comparison with the case of dirty bearings, about 60 per cent, and when compared with clean dry bearings about 33 per cent.

The Ideal Boiler Company of Chicago announce in a circular addressed to the New England trade that they will open a branch office in Boston at 45 Oliver street, corner of Franklin. They will have at their office samples of their new line of boilers, and also all of their other hot water and steam specialties which they sell under the name of the Ideal. Their office is centrally located in the midst of the heating district, and it seems quite probable that the New England trade will accept quite generally the invitation conveyed in the circular, and call upon them when visiting the Hub.

We are informed that the American Boiler Co., whose general offices are at 84 Lake street, Chicago, never know what dull trade means It is natural to infer that such a state of things is not brought about by any member of the company resting on his oars. The steady continuous hustle will tell, and the company are to be congratulated on the number of bright young men that make their goods popular. Again, they are fortunate in manufacturing steam and hot-water heaters which have been long on the market, such as the Florida, Bolton, Spence, Perfect, and Soliel, as well as a large list of other types. All callers at their Chicago or New York offices are always sure of a cordial welcome.

The United States Radiator Co. of Dunkirk, N. Y , send us their catalogue for the summer of 1894. The company state that for the past four years it has been their aim to build up a reputation as manufacturers of a radiator having the full area of heating surface claimed, together with faultless construction. They say the many testimonials found elsewhere in this work will, we believe, justify our belief that we have succeeded. The company state that their aim for the future will be to make the best radiators on the market, to carry a full line of the various classes and kinds wanted by the trade, and to make exceptionally prompt shipments. The catalogue is well illustrated and will be sent free on application.

The F. W. Foster Mfg. Co. of Boston have received so many calls for the Foster patent "F-P" ball valve that they have found it hard work to supply orders The points on the valve are first, that it closes automatically and instantly under any pressure without the aid of springs, and in the direction of the flow; second, it opens and closes with a variation of but one-half of an inch in the water level and will not siphon water from tank; third, for the Foster "F-P" ball valve a float four inches in diameter, attached to a lever ten inches long, will be found sufficient to operate any size valve from ⅝ inch to six inches inclusive. Every plumber should send for a circular It will be dollars in his pocket. The Walworth Mfg. Co. of Boston are the exclusive agent

The Kernan Furnace Co. of Utica, N. Y , was incorporated in April, 1890. The capital of $20,000 was contributed by five gentlemen, all of whom have had many years of experience not only in the foundry, but also in the commercial and financial management of the stove and furnace business. The capital from that date has been gradually increased until now it reaches $100,000. The company manufacture a complete line of warm air furnaces, embracing sizes from 14 inch to 30 inch fire pot, varying in weights from 400 to 3000 pounds, suitable for heating spaces of from 5000 to a hundred thousand cubic feet. The company claim their line of furnaces is to-day more complete, and embraces more styles, than can be offered by any one manufacturer, either in brick set or portable form, steel or cast iron.

Walker & Pratt have been awarded the heating contract for the Eustis street school, Boston, at $4,200.

Lynch & Woodward have been awarded the heating of the Moulton street primary school, Boston, at $4,082.

Wood & Bishop of Bangor, Maine, who have manufactured stoves, furnaces, etc., since 1839, have just been incorporated as the Wood & Bishop Co., with a capital of $120,000.

The firm of McGinniss, Smith & Co. of Pittsburg, Pa., has been succeeded by a corporation to be known as the McGinnis–Smith Company. The incorporators are Wm. K. McGinnis, Robert S. Smith, and John A. Langdon.

The Superior Stove and Furnace Co., Cleveland, O., capitalized at $10,000, for the manufacture and sale of stoves, furnaces, etc., has just been incorporated. George Zeller, Wm. H. Switzer, Myron M. Shemgold, George Schindler, and WalterJ. Hamilton.

The Key City furnace, an invention of D. W. Thomas, Harriman, Tenn., is the latest candidate for honors. It is adapted especially for soft coal, and has return flues, a sectional fire pot, and is self-cleaning. A stock company is now forming to push it.

Sixty-eight years of continuous success—that's a great record, but it's a true one of the Presbrey Stove Lining Co., of Taunton, Mass., who were established in 1826 and incorporated in 1866. Their goods are recognized throughout the world as the standard in their line.

The Pennsylvania Gas Furnace Co. of 77 West Chippewa street, Buffalo, N. Y., advise us that they are getting ready very fast to manufacture their new furnaces for burning gas. R. E. Edmonds is president and general manager, and F. L. Grady secretary and treasurer.

The Sanford Heating Co. of 113 Beekman street, New York, will act as agents for the Kelsey Furnace Co. of Syracuse in this vicinity. L. V. Sanford is manager of this company, and he will be pleased to show the entire construction of the Kelsey Furnace to all who may call.

We regret that the accident to Secretary Squires of the New York Central Iron Works of Geneva was so bad that he was laid up at the Imperial Hotel, this city, for several days, and is now at his home in Geneva convalescing. The major was fortunate in having Dr. John Munn, Jay Gould's physician, to atttend him, Dr. Munn being an old friend.

The rapidly increasing interest in the Powers' regulator has rendered better and more convenient office facilities necessary. The company (Powers' Duplex Regulator Co.) have therefore located at No. 36 Dearborn street, Chicago, where they will be pleased to see their friends in the heating trade, and all others who are interested in automatic heat regulation.

The Craig-Reynolds Foundry Co of Dayton, O., have appointed George D. Hoffman general Western manager. Mr. Hoffman will be located at 82 Lake street, Chicago, and will have general supervision over the states of Indiana, Illinois, Kentucky, Missouri, Kansas, Nebraska, Iowa, Wisconsin, Minnesota, and the Dakotas. The Hoffman-Russell Co. will handle Chicago and Cook county. The company have also agreed to manufacture furnaces of a special design to meet the views of Mr. Hoffman. Catalogue ready now.

The Barstow stove Co. of Beekman and Water streets, New York city, send us catalogues of the Jewell gas stoves for 1894. This line of stoves are manufactured by Geo. M. Clark & Co. of Chicago, Ill., and consist of 78 appliances varying in cost from 75 cents to $68. The hobby of the company has been good combustion, aided by good burners, valves, and tubes, to which should be added good mechanical construction, artistic appearance, and convenient arrangement of baking parts. The 1894 additions are two large ranges and three baking plates, with boilers below. The list price of certain sizes has been lowered.

In our last issue we failed to mention the Exhibit of the Holland Radiator Co. at the recent Master Steam Fitter's convention held in New York, June 19th, 20th, 21st and 22nd. This was the more unfortunate as their exhibit was one of the finest made, and the beautiful types of radiators shown by them were most favorably commented on. The radiators shown were for every known use and handsomely decorated. The company were represented by T. Holland, president, and L. B. Collins, treasurer. These gentlemen are now located at the New York office, 69 Centre street, where these radiators can be seen. In addition the company have now on exhibition and ready for sale a new fluted radiator, 15 inches high, which contains 3¼ feet, for window radiation. Each section is ornamented with the same pretty design as shown on present goods. The new radiator is equipped with an improved right and left hand threaded nipple, which the company believes will be regarded by the trade as an improvement over anything yet produced. The joint is made metal to metal, and can be ripped by hand wrench, or monkey wrench, as no gasket or red lead is used. This makes a perfect tapered screw joint. The new nipple will be used hereafter on all fluted radiators sold by the company. Mr. Holland states that he has received such strong encouragement since coming to New York that he will move his family here and make this his home.

Catalogue number six of the Mosely Folding Bath Tub Co., 161 South Canal street, Chicago, Ill., manufacturers of folding bath tubs and water heaters, has been received. It is completely illustrated, and its opening page contains the greeting of the company for 1894. The folding bath tub originated from a demand for private baths. The Mosely folding bath tub is complete in all appointments, the quality of the cabinet work being of the best and selected kiln-dried wood. The linings are glaze white enamel covered zinc and 14-ounce cold-rolled planished copper. The waste outlet is flexible, with brass couplings for attaching lead, iron, or hose pipe leading to sewer or any other receptacle. The tub has a positive action in opening and closing, which is assisted by spiral springs connected with the adjustable back supporting the heater, rendering manipulation easy. When closed the tub occupies a space of but 25½ by 28½ inches. The weight when packed for shipment is 250 pounds. The heater comprises a 20-gallon tank, to which is attached an inverted cone-shaped copper coil, giving a great heating surface to the water which is at once set in motion by the intense heat (700 degrees) from the flame of the burner underneath. After a complete circulation the water heated to desired point returns and is discharged from the faucet at the hottest point. The burners are new (1894), simply constructed, absolutely safe, and without odor. Tanks are fitted with gas or gasoline burners as required. The company also manufacture the security waste and overflow plug, which excludes sewer gas. The New York office of the company is at 7 W. 14th street, in charge of E. O. & W. K. Stafford. Catalogues will be mailed on application.

It is reported that the Bridgeport (Conn.) Steam Heating Co. have increased their capital stock from $10,000 to $20,000.

The new building of the Royal Steam Heater Co. of Gardner, Mass., is now ready for occupancy. It is three stories high and will be used as a first-class machine shop, in connection with their foundry, for the manufacture of steam heaters.

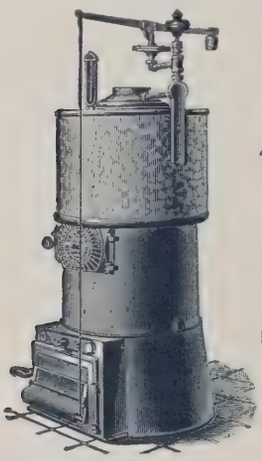
The Ellicott Electric Heating Co. of Buffalo was incorporated in June; capital $25,000. The company will manufacture electrical heating and cooking apparatus. Dan'l O'Day of the Standard Oil Co., and Chas. R. Huntley of the Brush Electric Co. of Buffalo, are among the incorporators.

The Board of Health of Brooklyn has adopted the Blake & Williams system of steam disinfection for clothes, etc., of contagious disease patients, and will at once instal it in the hospital building at Flatbush. This system is in operation in many hospitals throughout New York State.

WANTED.

Announcements in this department will be inserted at the uniform rate of twenty-five cents per line. For five or more insertions of the same advertisement we make a discount of 10 per cent. Calculate on nine words to a line.

A BARGAIN.—No. 6 Gorton Boiler; latest pattern; used three months; in fine condition. Address "GORTON," care H. & V. Pub. Co., 145-146 World Bldg., New York.



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ALL RIGHT.
The best and
ONLY
Self-regulating
Hot Water Heaters
on the market

FOR STEAM HEATING
Manufactured by.
The Wm. H. Page
Boiler Co.,
Norwich, Conn.

THE CELEBRATED SANITAS TRAPS

ENDORSED BY SANITARY EXPERTS AND LEADING PLUMBERS.

SANITAS Traps are used unvented in many of the principal cities of the United States, making a great saving to the Plumber and to the user. The Sanitas is the only Trap that will stand both syphonage and evaporation and hold its seal under the most adverse circumstances. Plumbers interested in giving their patrons the best will invariably give preference to the Sanitas Traps Made in Lead, White Metal or Iron. Send for Special Circulars.

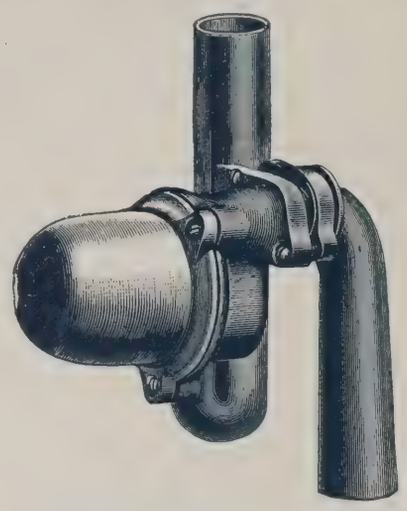


Fig. 9. Sanitas Adjustable Lead Trap, making a Full S-Trap.

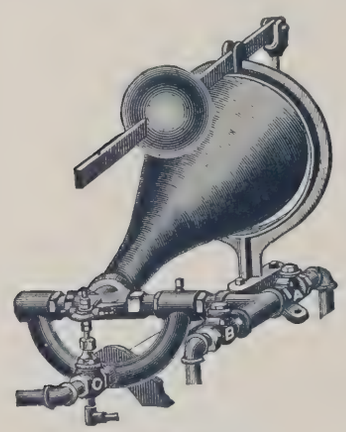


Fig. 11a. Sanitas Brass Trap.

Smith & Anthony Co., MAKERS Sanitas Plumbing Appliances.

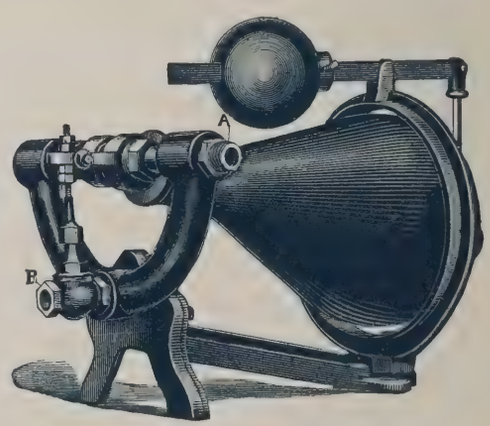
48 to 54 UNION STREET, BOSTON.

56 BEEKMAN ST., NEW YORK. CHICAGO AGENCY, 217 LAKE ST.



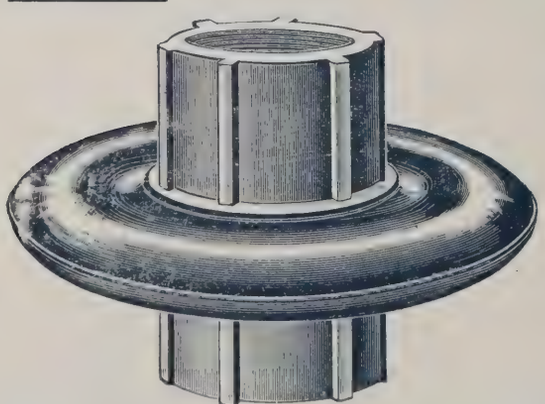
Bundy Return Steam Trap.

BUNDY
Return and Tank Steam
TRAPS
ARE THE BEST.
(*Manufactured under the LITTLEFIELD PATENTS.*)



Bundy Tank Steam Trap.

They have no interior parts to get out of order. No floats. No packed joints. All parts are exterior. The Return Trap takes the place of a steam pump. Costs less money and saves the steam and fuel. Correspondence solicited, and prices cheerfully quoted.



Bundy Major Improved Elastic Coupling saves time and fittings. Takes care of expansion and contraction in pipes.

MANUFACTURED EXCLUSIVELY BY

A. A. GRIFFING IRON CO.,

NEW YORK: 15 DEY STREET.

CHICAGO. BOSTON. PHILADELPHIA.

Works: Jersey City, N. J.

RADIATOR DECORATION,

INCLUDING

Enameling, Bronzing, and Tinting.

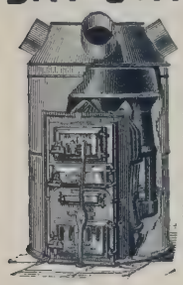
Wall Paper, Woodwork, etc., Matched.
Estimates Cheerfully Given.

REFERENCES: The leading steam fitters of Boston and New England.

Expert on all questions appertaining to Bronze Powders, Enamels, etc.

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20 Cazenove Street, Boston, Mass

THE CELEBRATED
BAY STATE FURNACES

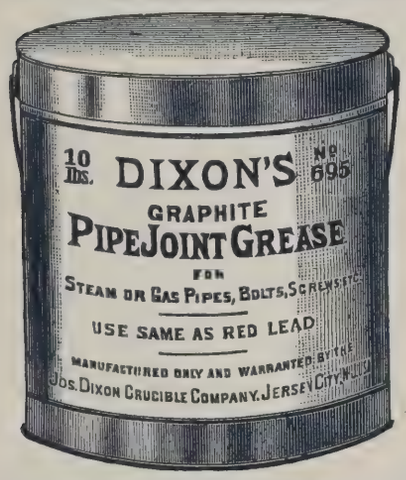


POWERFUL, DURABLE, ECONOMICAL,

Barstow Stove Company,

MANUFACTURERS,
Beekman & Water Sts., New York.
Providence, R. I. Boston, Mass.

ESTABLISHED 1836.
Prices, Catalogues, and our interesting publication, "Fireside" mailed on application.



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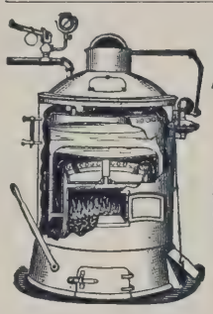
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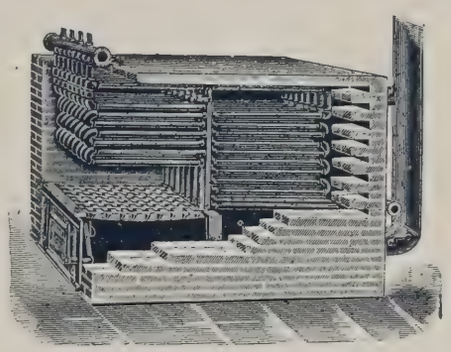
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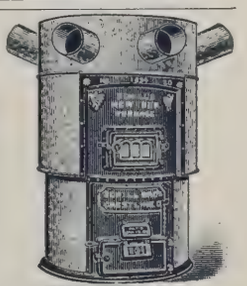
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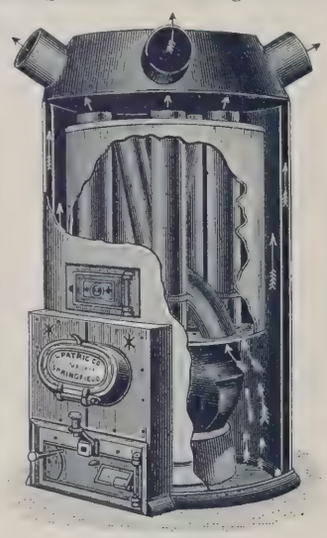
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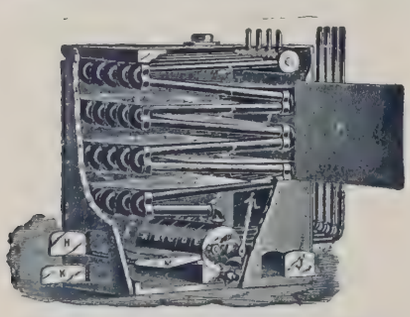


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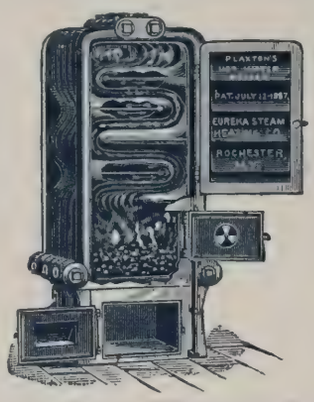


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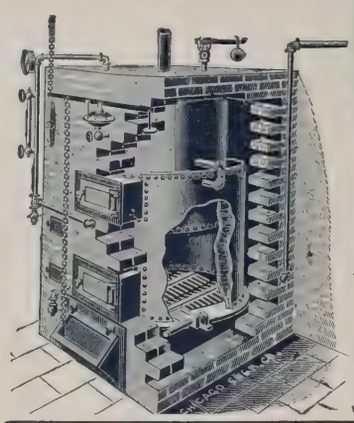
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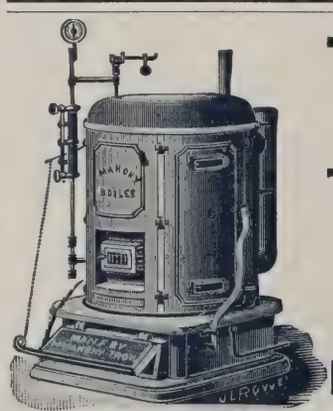
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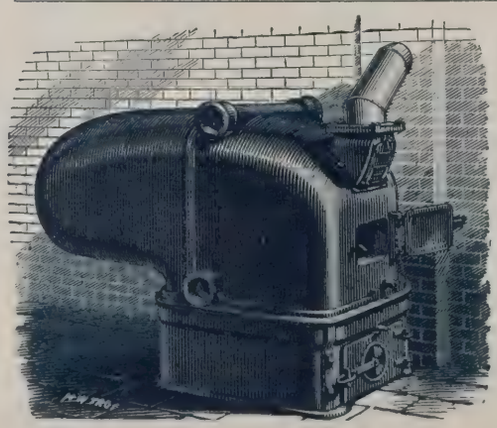
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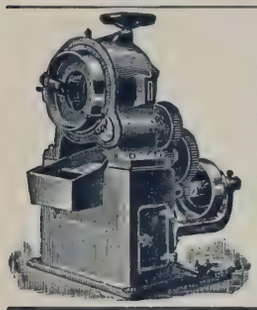
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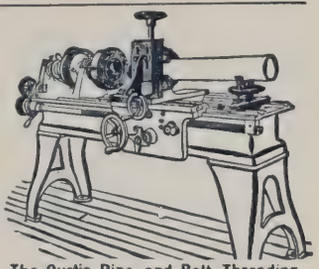
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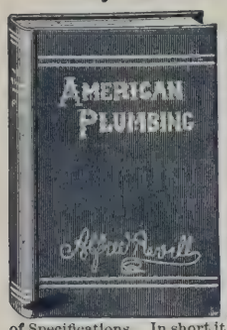
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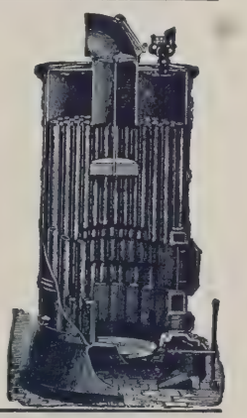
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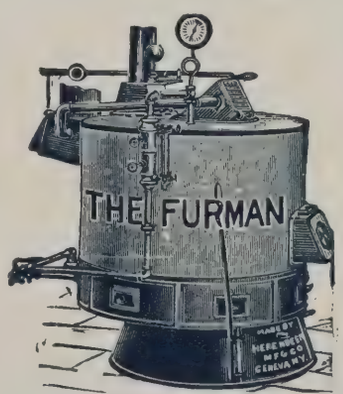
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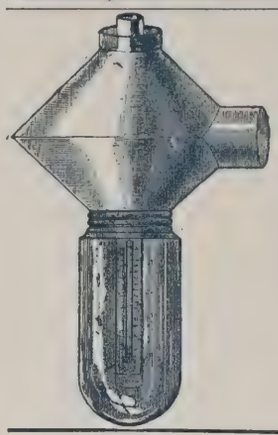
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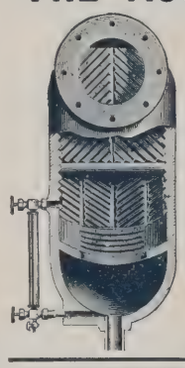
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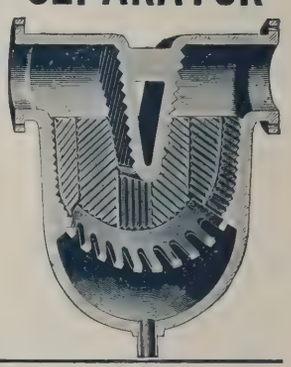
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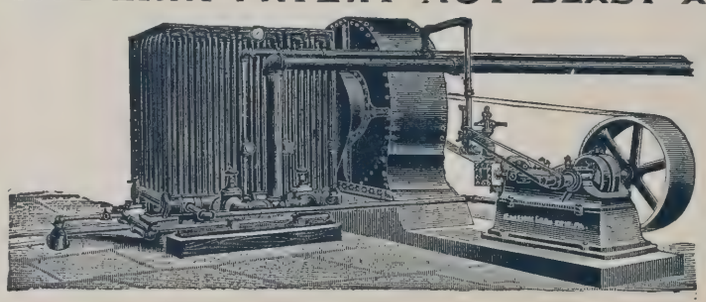
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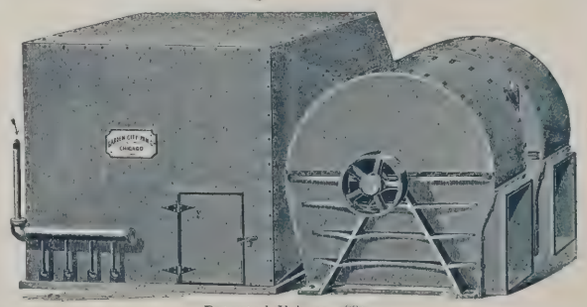
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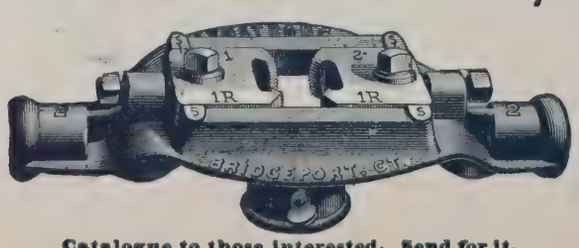
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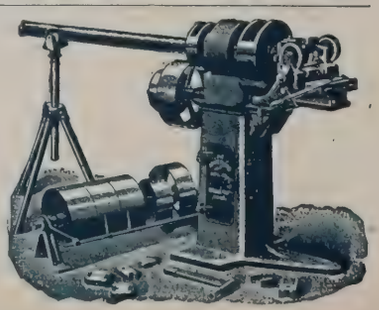
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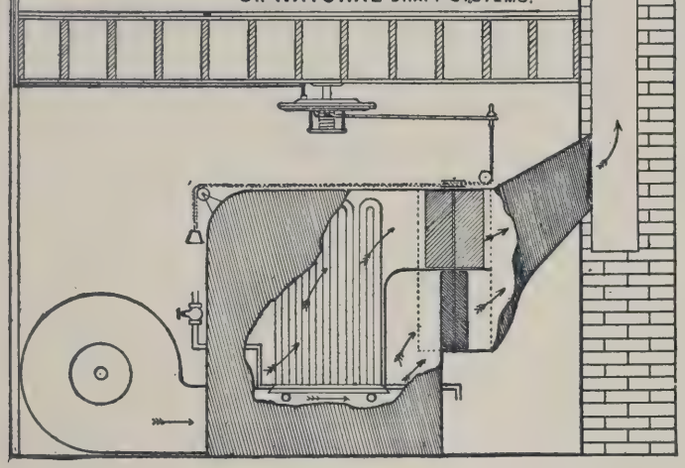
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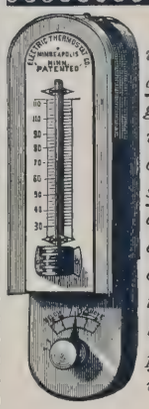
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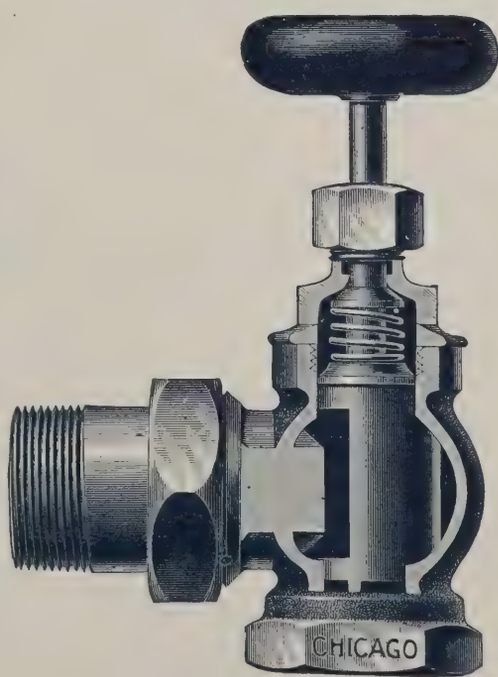
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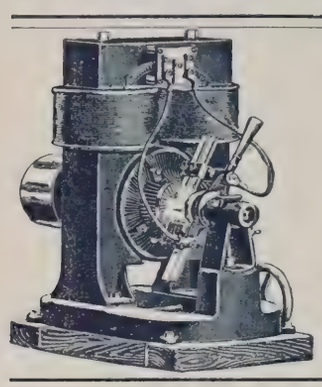
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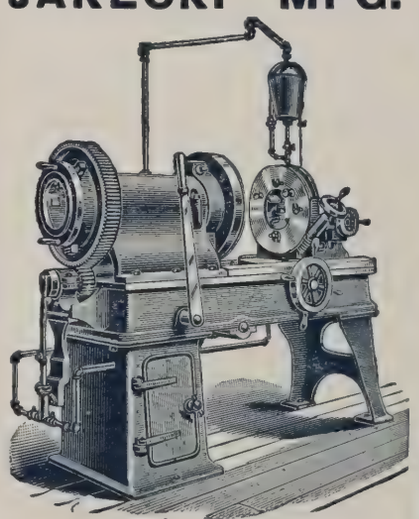
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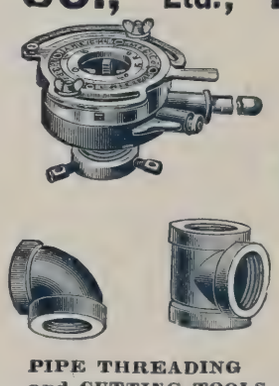
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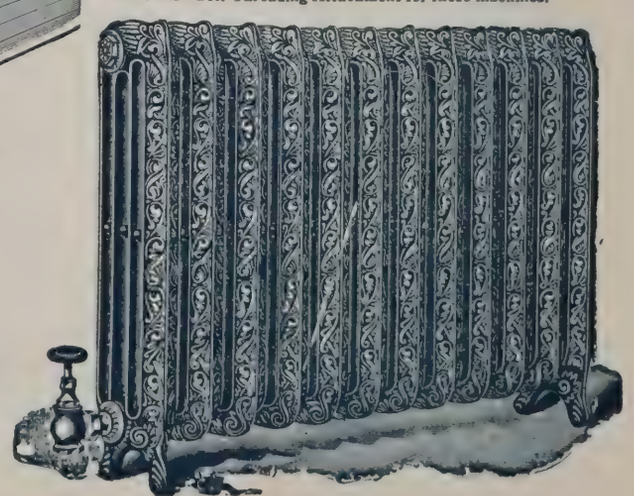
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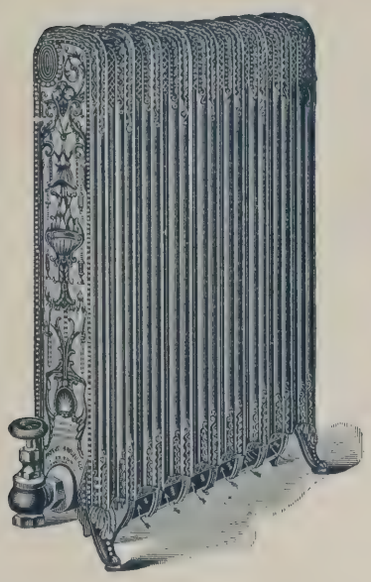


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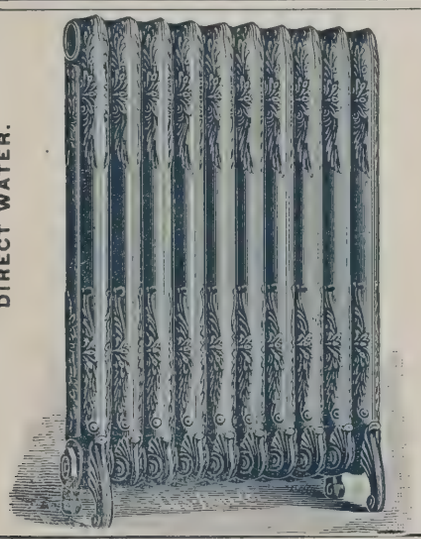
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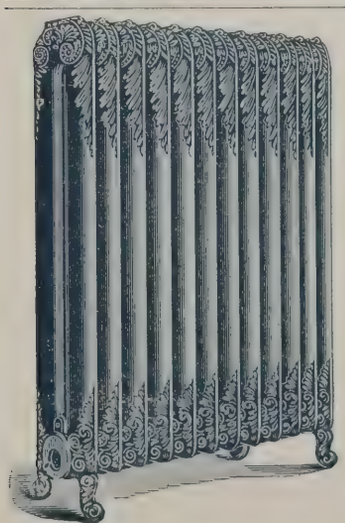
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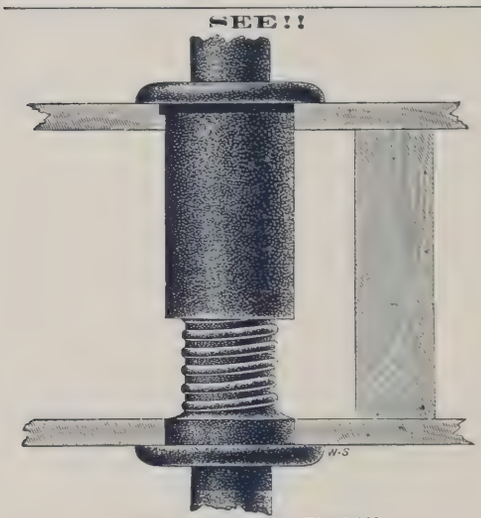


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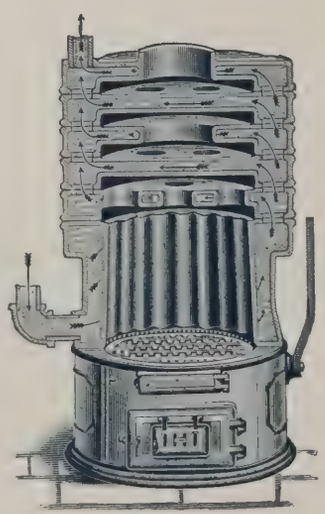
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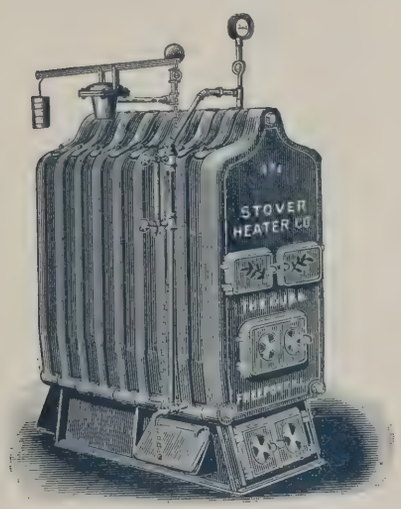
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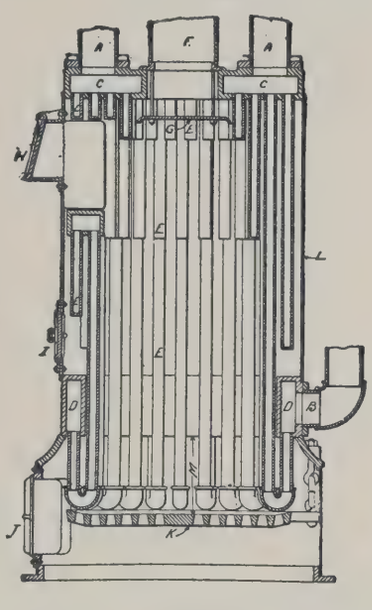
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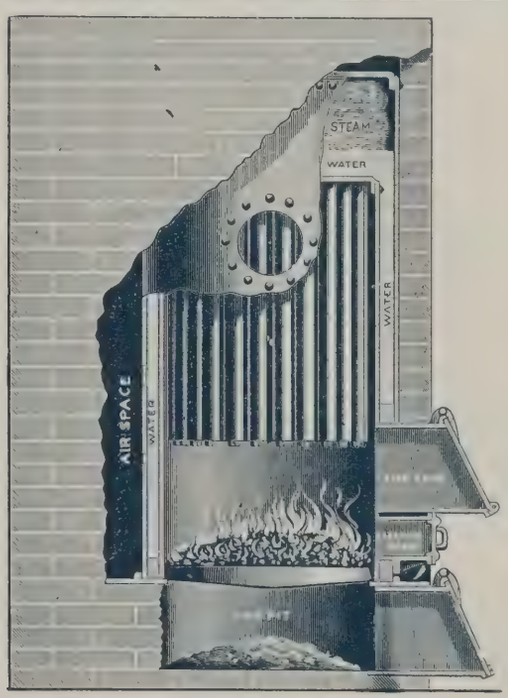
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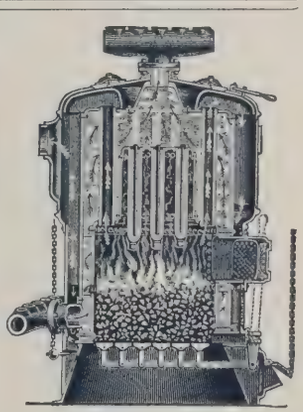
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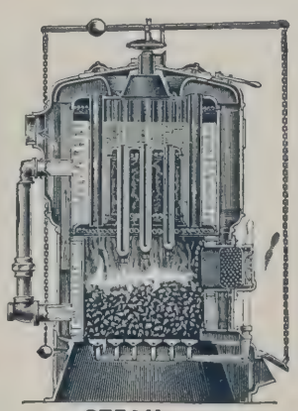
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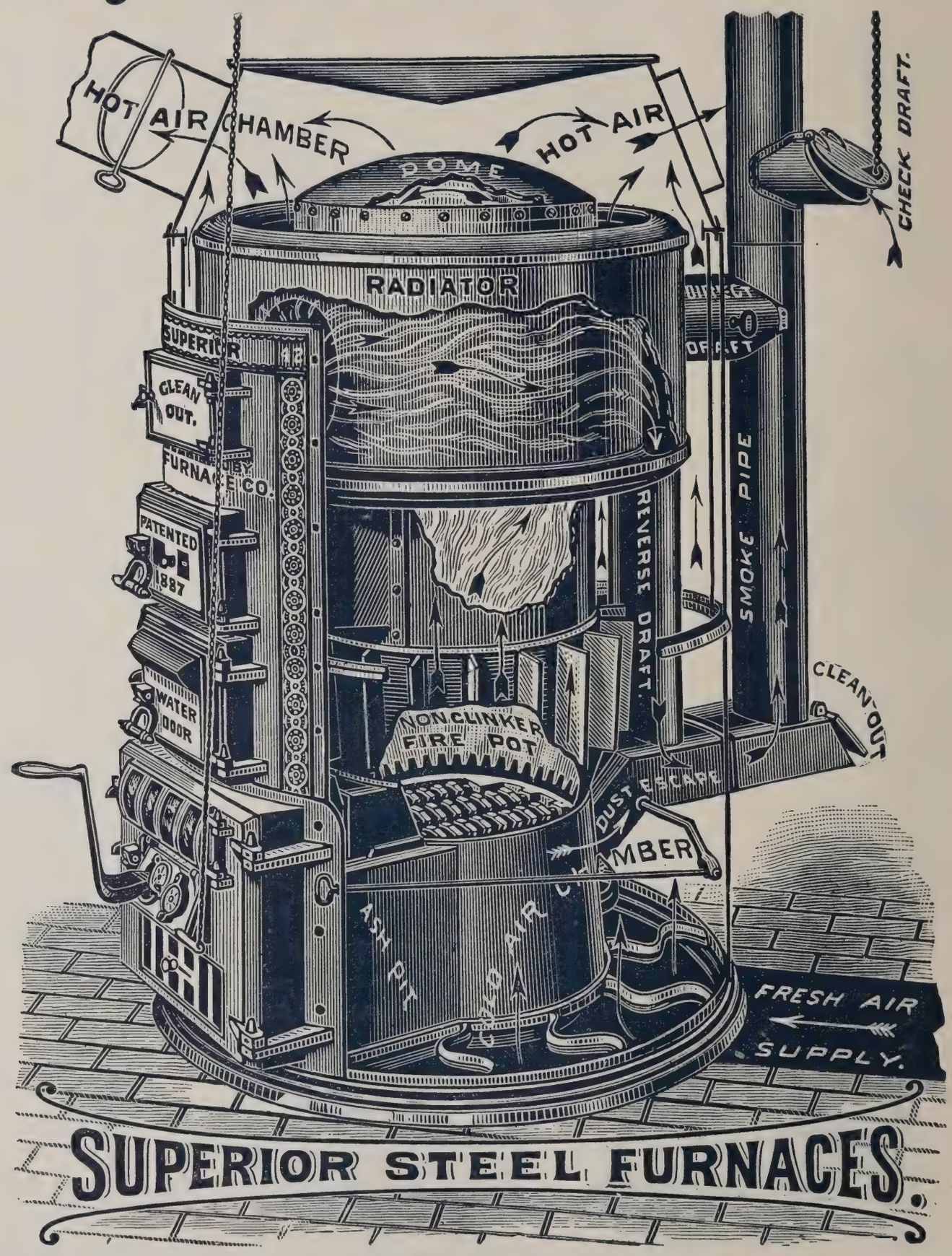
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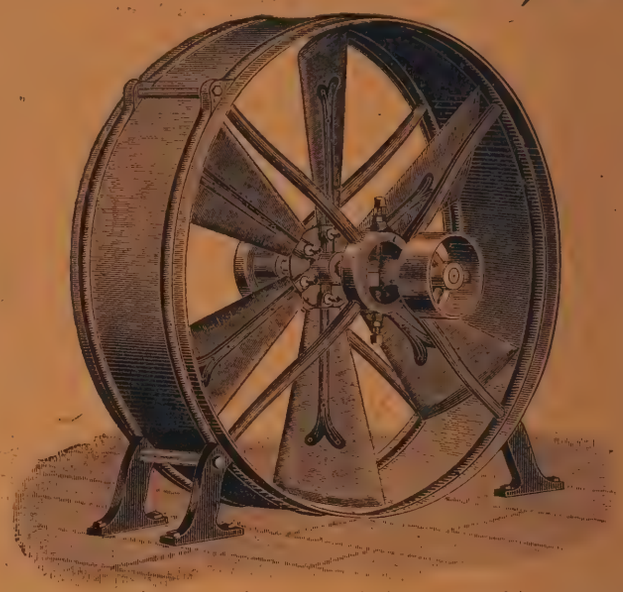
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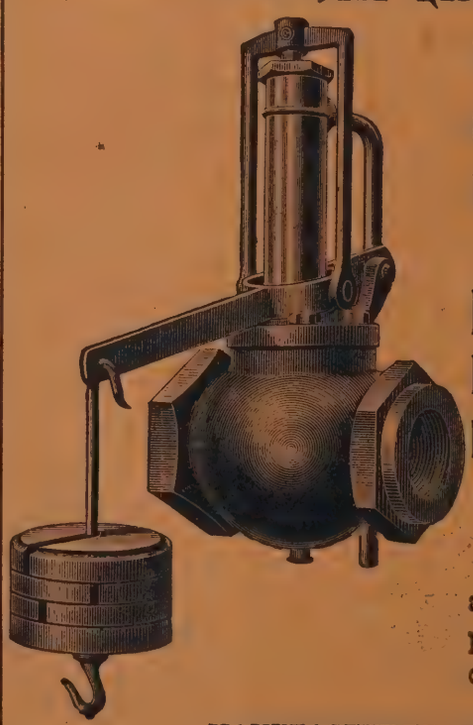
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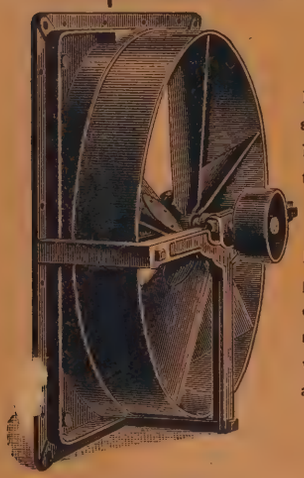




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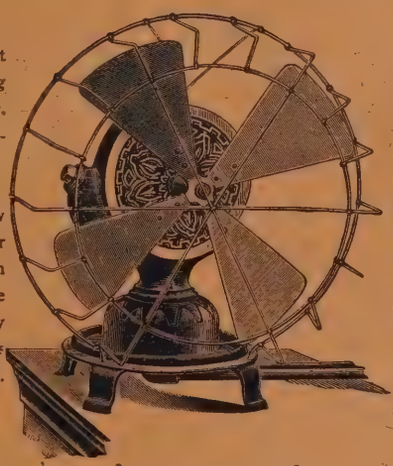
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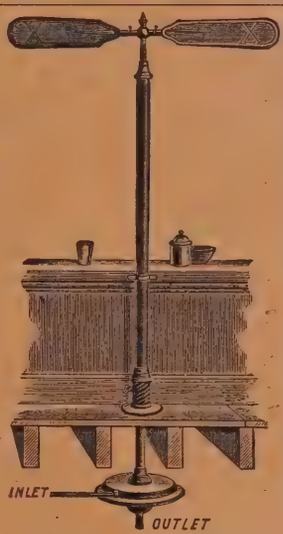


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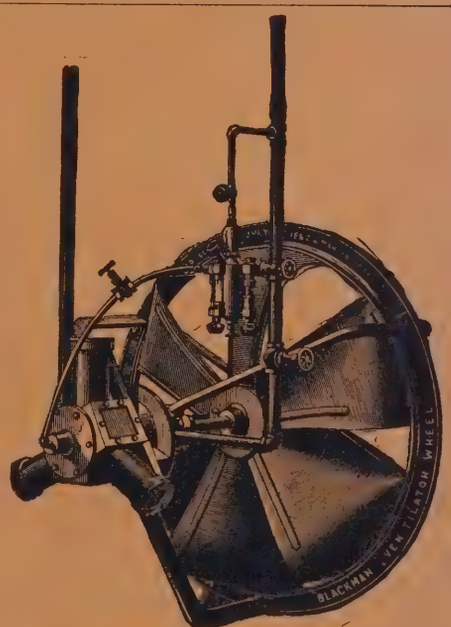
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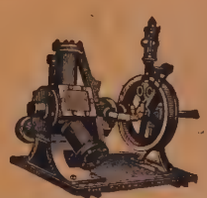
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The Blackman. (Diagonal View.)



The Blackman. (Back View.)



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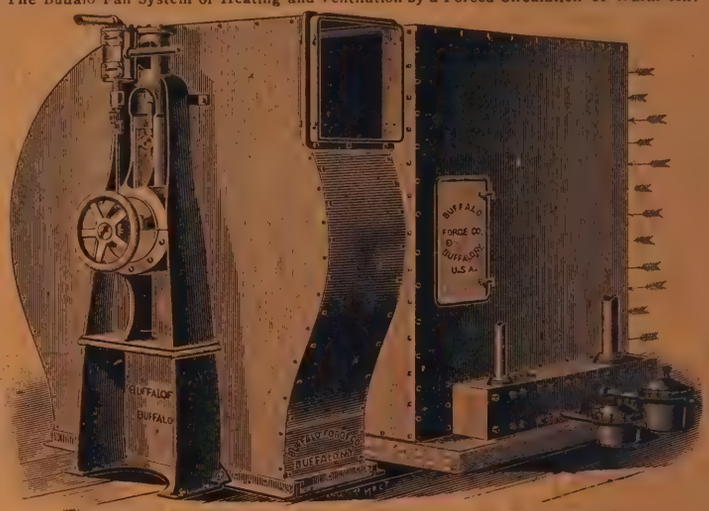
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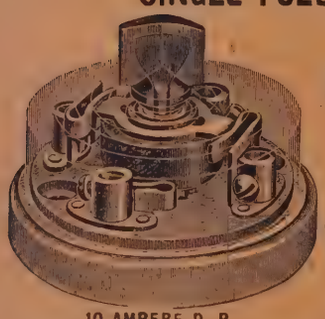
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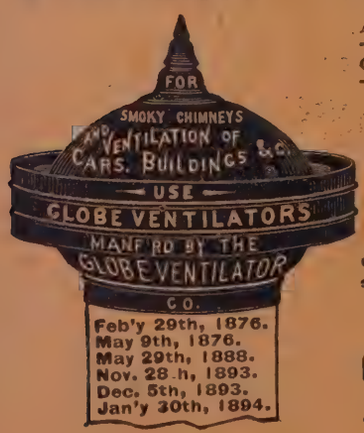
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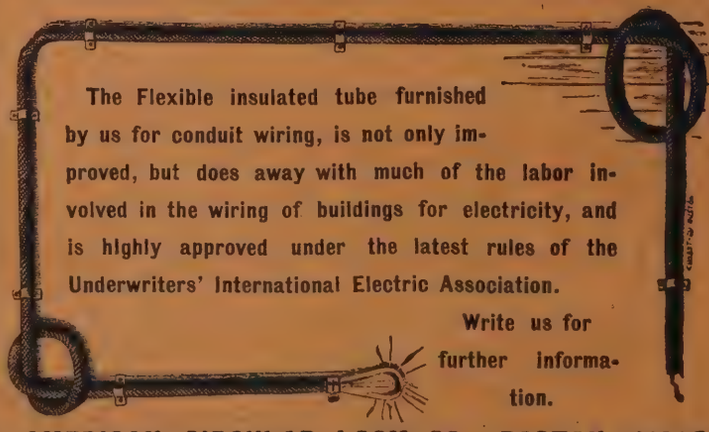
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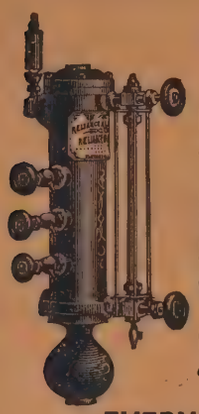
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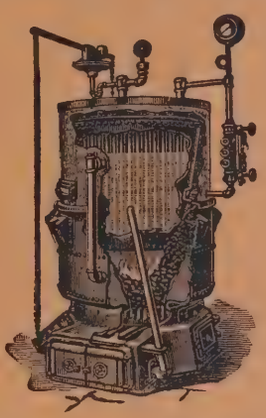
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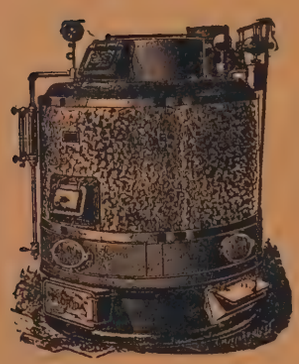
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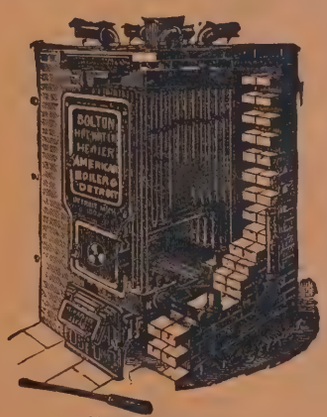


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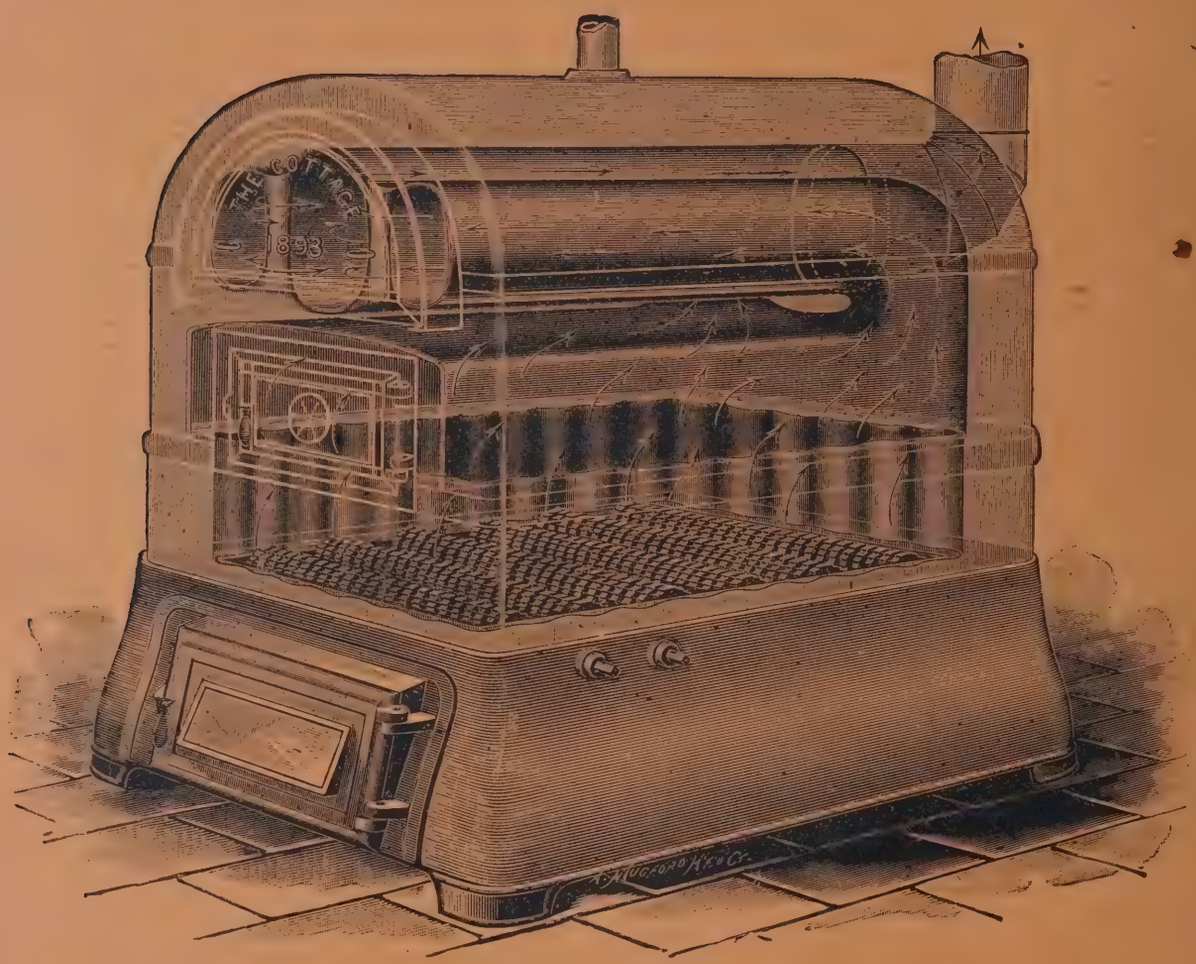
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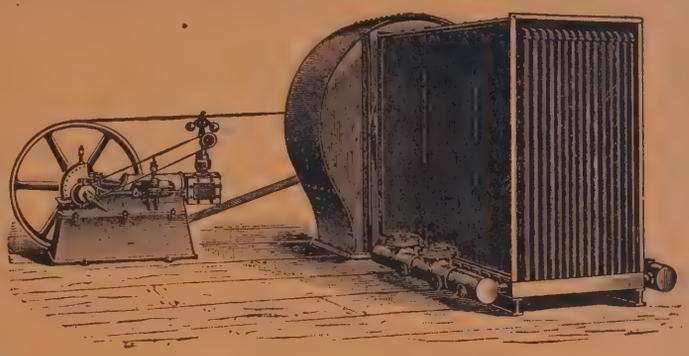
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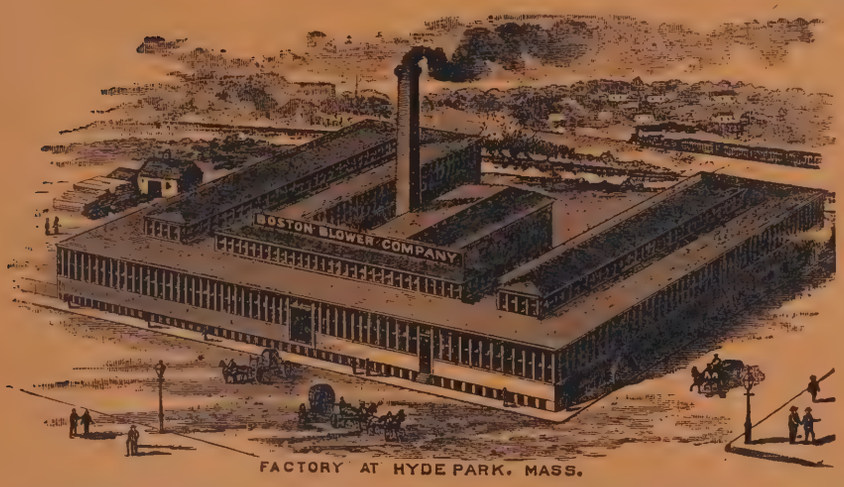
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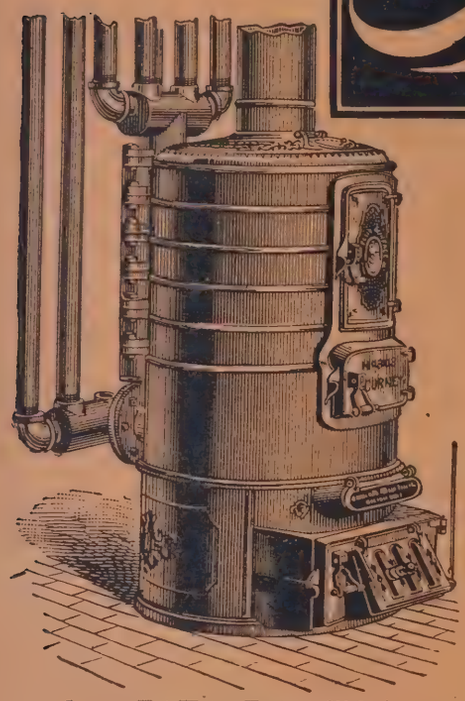


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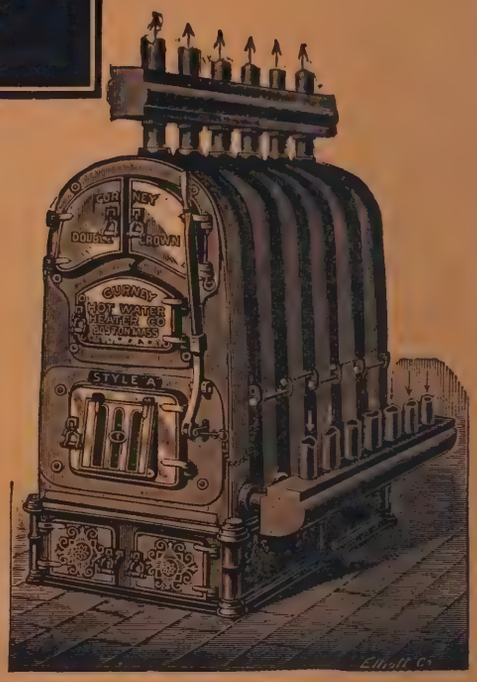
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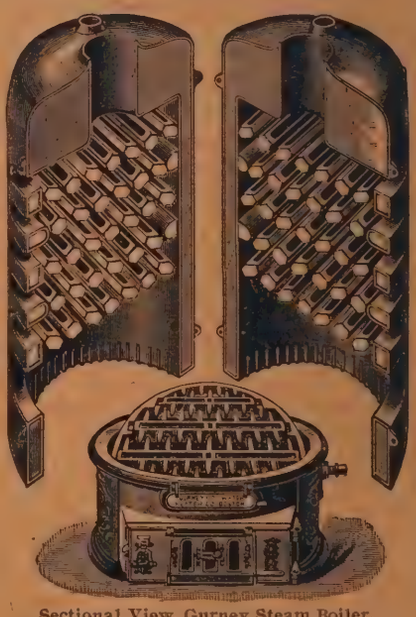
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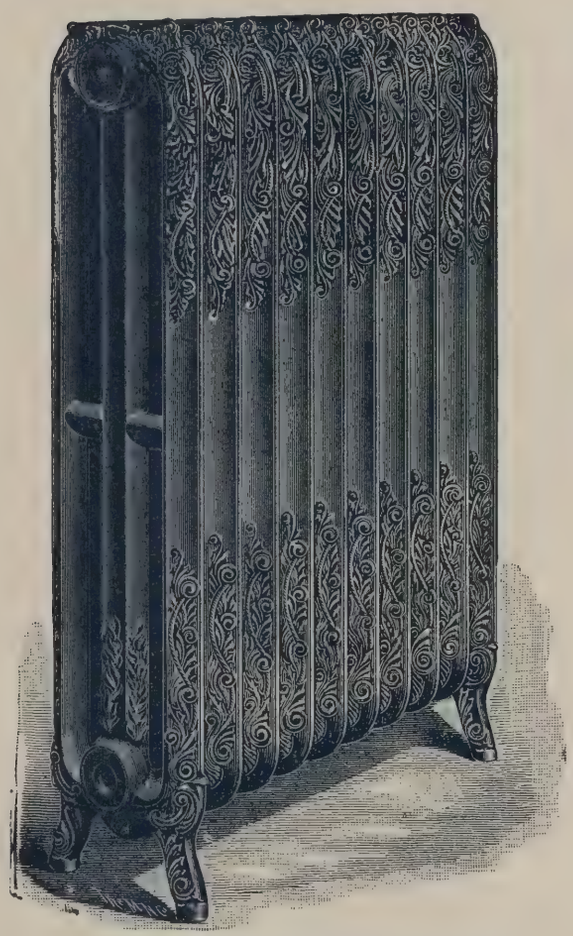


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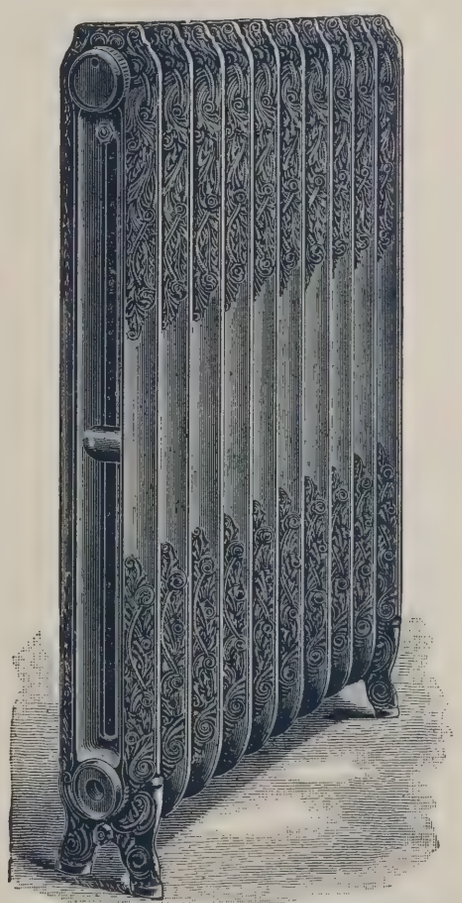
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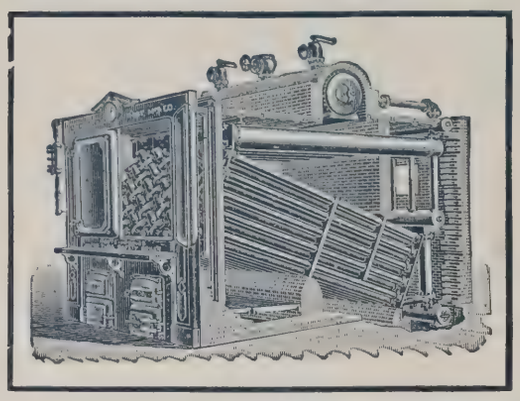
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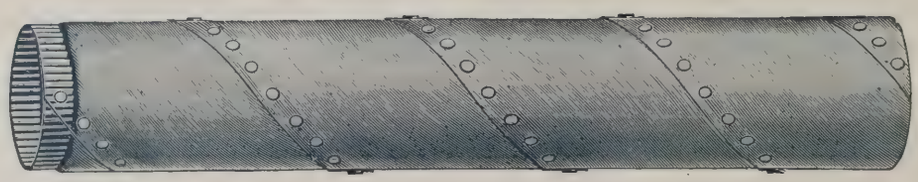
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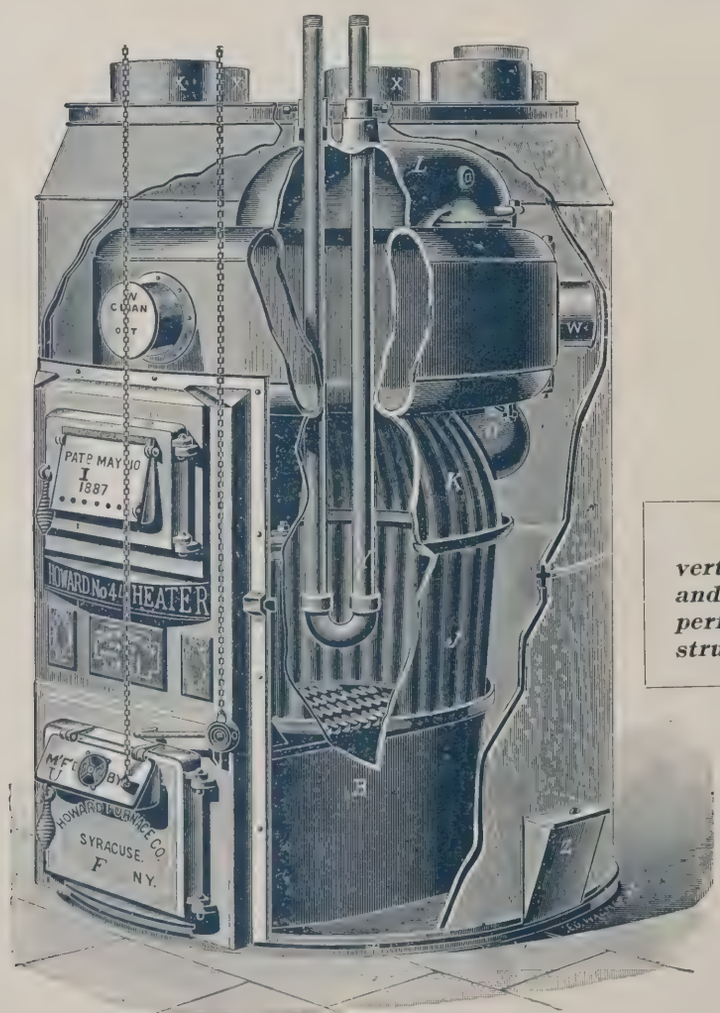
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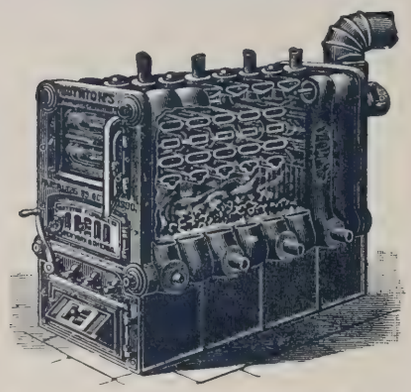
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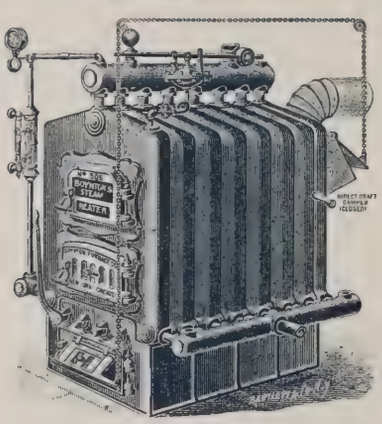
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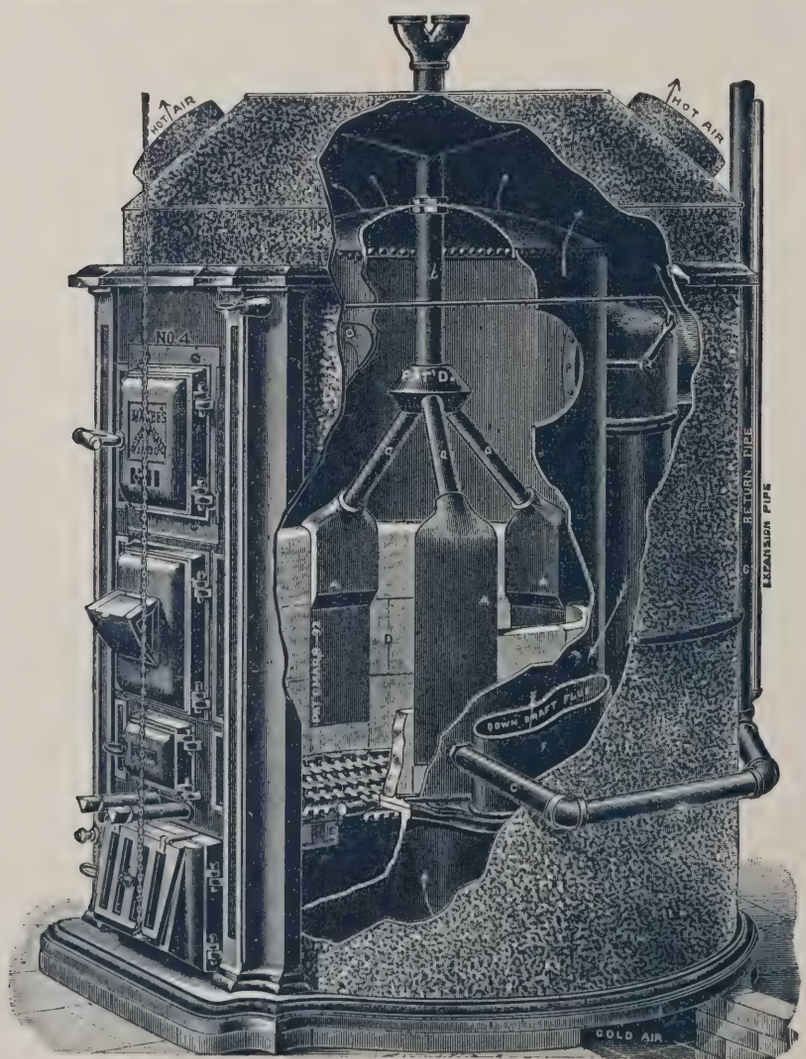
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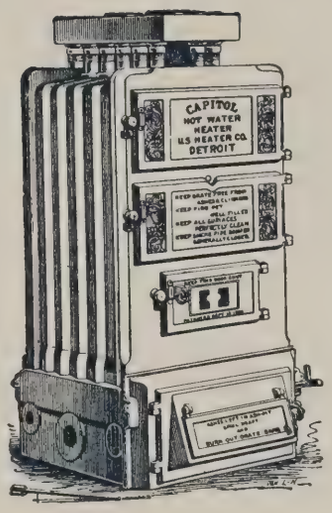
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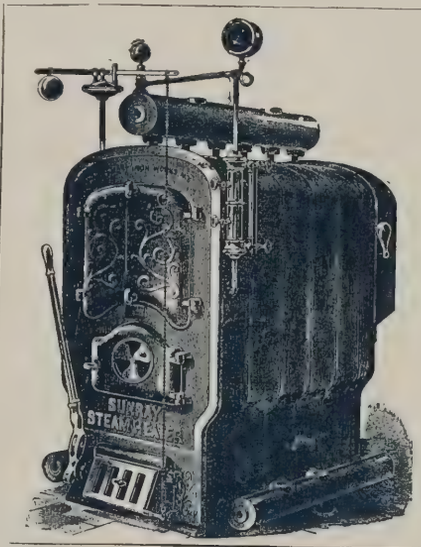
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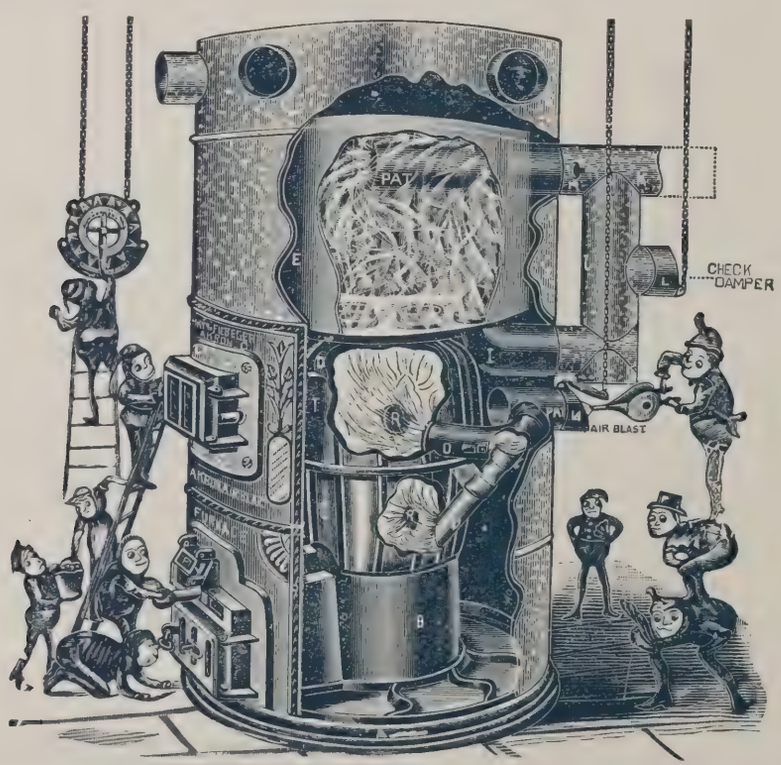
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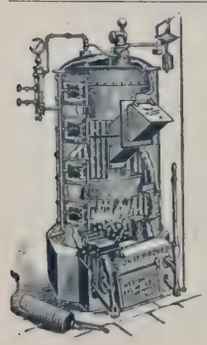
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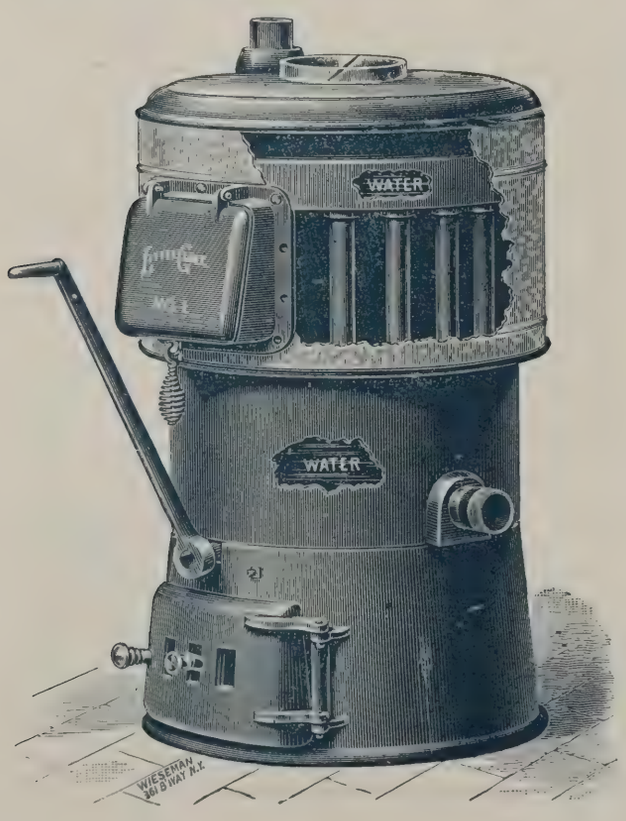
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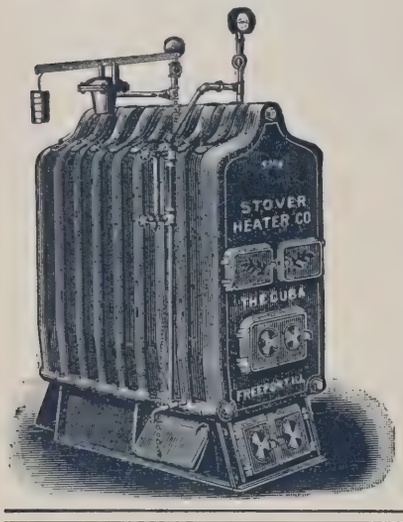
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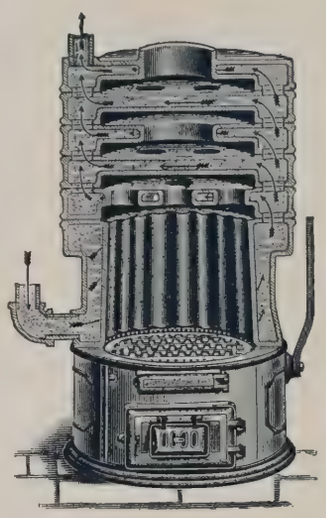


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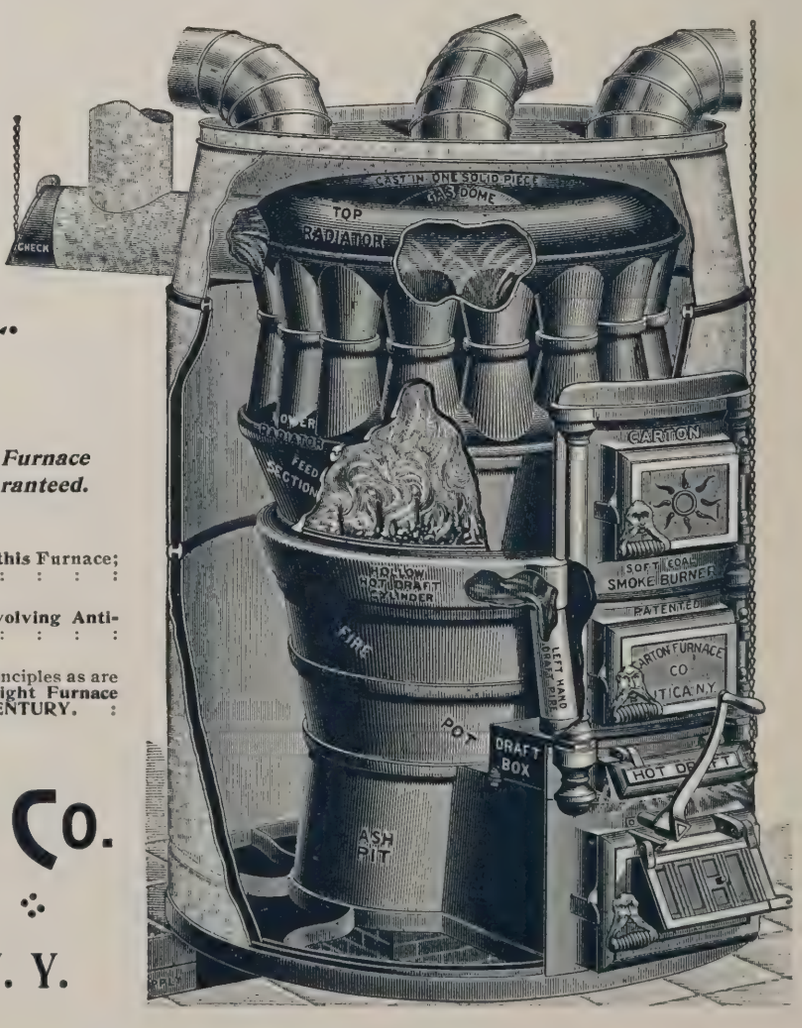
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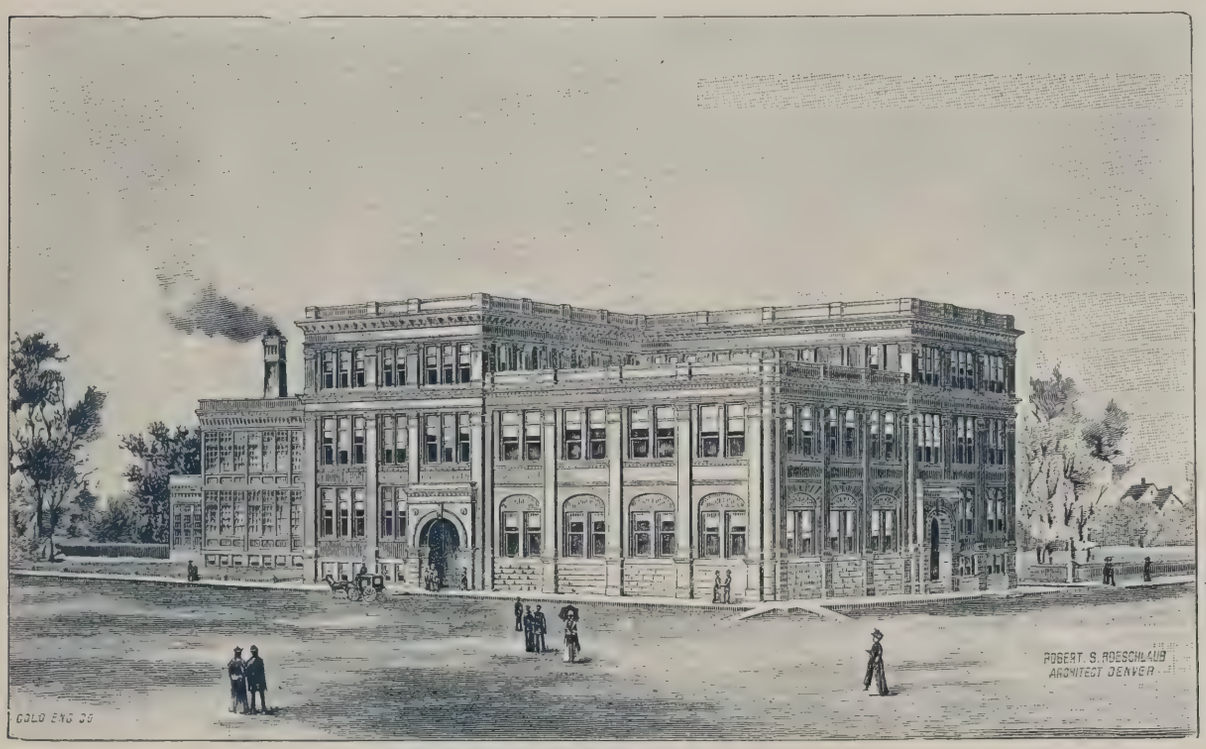
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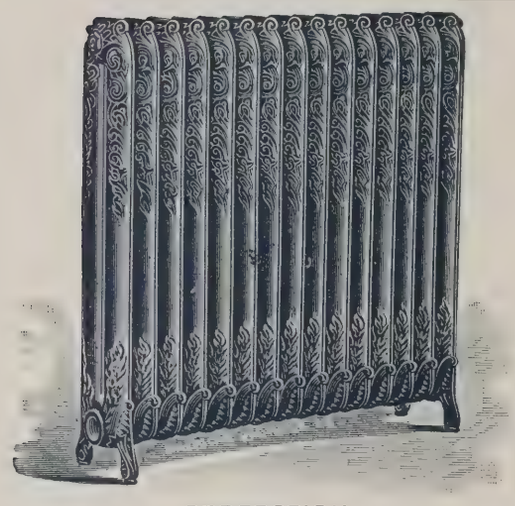
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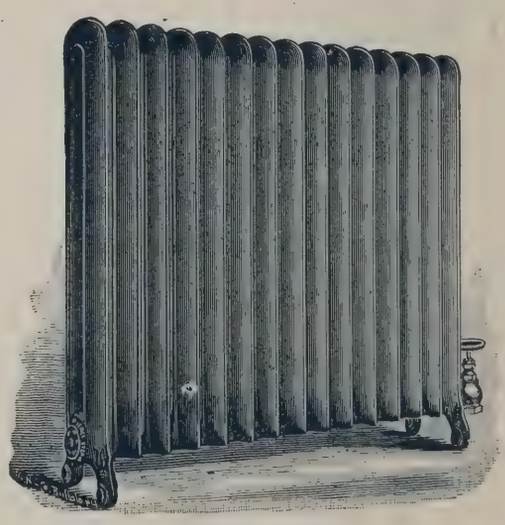
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Heating and Ventilation

NEW YORK. (Copyright, 1894.) AUGUST 15, 1894. (All rights reserved.) CHICAGO.

Hamburg (Germany) City Hall.

The heating and ventilation of this building has been described at length by Jos. Strebel, who has published an account of it in German, with a large number of plans. Those who desire to get a better idea of the system than is given by the appended description are referred to the transactions of the Zietschrift des Vereines deutscher Ingenieure, Vol. XXXVIII. As shown by the accompanying cut, the building is three stories high, with cellar, basement, and attic, the main building having two wings which connect what is called the exchange in the rear with the city hall proper, forming an open court yard enclosed on all sides. The necessary steam for heating and ventilating is supplied by the city electric works, the distance from the boiler house of the city's plant to the steam distributor in the city hall being 330 m., or a little over 1,082 feet, the steam at 90 pounds pressure being conducted through a copper pipe 170 mm., or about 7 inches in diameter, a second pipe of the same diameter being laid as a provision against a possible accident. The distance from the steam distributor to the radiator farthest away from it is 270 m., or nearly 886 feet, so that to reach the radiator the steam has to travel a total distance of 600 m., or a little more than 1,968 feet. The method of heating is by low pressure steam through direct and indirect radiation. The apparatus for heating by direct radiation is divided into four large heating groups, in each of which there are two boilers in which the low pressure steam is generated by the high pressure steam supplied by the city electric plant. These boilers are 1,100 mm. (43.3 inches) in diameter, 1,900 mm. (74.8 inches) long, and have screwed fronts, being tested to withstand a pressure of 160 pounds. Within each boiler is a series of copper heating coils 60 m. (196.85 feet) long and 35 mm. (1.38 inches) in diameter through which the high pressure steam passes. The heating coils are arranged on rollers so as to be readily removable for cleaning. The regulation of steam pressure is effected by means of the well-known Bechem & Potschen regulators.

Steam from the boilers is led upward through four vertical copper pipes 100 mm. (about 4 inches) in diameter through two brick shafts to a point nearly 4 m. (13 feet) above the attic floor, where they branch off in horizontal lines which follow along the walls about 3 m. (10 feet) above the floor, 87 vertical risers descending to the basement, where they unite and are led back to the boiler. To these risers, which are placed inside of the wall recesses near the windows, plain surface radiators, manufactured by the American Radiator Co., 92 Center street, New York city, are connected. The radiators, as a rule, are set up in the window recesses, and are provided with automatic air valves, and with Meyer's regulating valves, by which the admission of steam, and consequently the amount of heat given off by the radiators is regulated automatically. Siphons, to which the regulators are connected, are inserted in all the vertical lines of pipes. Each vertical line of piping is provided with a valve in the attic and one in the basement, so that in case any pipe needs repairing it may be shut off without affecting the operation of the others. The main piping from each group of two pair of boilers runs upwards in the same shaft to the attic, where the two pipes are connected by means of unions, so that in case of injury to one pair of boilers or the main piping from them, the other pipe can be used for both heating groups, and by putting in blind flanges the damaged pipe can be taken out. Provision is also made for cutting out the heating boilers and using the high pressure steam direct.



THE CITY HALL OR MUNICIPAL BUILDING, HAMBURG, GERMANY.

Both the supply and return piping is of heavy copper throughout, due allowance being made for expansion and contraction, and the system is so arranged as to be easily controlled from one point. All piping which does not serve for heating purposes is covered with non-conducting covering to prevent loss of heat, and all pipes are readily accessible and can be changed without disturbing plaster or wood work.

A combination of the plenum and exhaust systems is used for ventilation, the air being changed once or twice per hour according to the uses for which the rooms are designed. As the rooms are lighted by electricity, and are very high, possessing a large capacity, this frequency of air change is considered sufficient. The cross sectional area of the ducts, as well as of the inlet and outlet openings, were calculated to accommodate a flow of air at the rate of 1.3 m. (about 4.26 ft) per second.

The fresh air is obtained from the center of the court yard, the air inlet being latticed, to guard against the entrance of small animals or plants, and concealed by a fountain, the overflow water from which is placed in shallow vessels in the underground tunnel through which the fresh air passes from the inlet to the fans, the water serving to cool the air in summer. Provision is made for regulating the flow of water to suit the demand.

Two Blackman fans, manufactured

by Howard & Morse, 45 Fulton street, New York, 1.8 m. (70 inches) in diameter, force the fresh air into the purifying chamber, in which all the dust and other impurities are removed by woolen filters after Grove's or Möller's patent. The purified air then enters a large central warming chamber, in which it is saturated with moisture and heated to about 54 degrees F., passing into a second chamber in which it is heated to about 68 degrees F. From the second heating chamber the air flows through the main air duct to the vertical ducts through which the hot air passes to the rooms, and at the bottom of which the air is heated by indirect radiation from 68 to 104 degrees F., the temperature at which it enters the rooms.

By means of mixing dampers in the indirect heating chambers the temperature of the hot air can be varied from 68 to 104 degrees, according to circumstances.

The air in the two central heating chambers is warmed by heating groups made up of single rows of pipes, the exhaust steam from the fan engines being sufficient to warm the air in ordinarily cold weather, high pressure steam being used only in extremely cold weather.

The impure air is drawn out of the rooms into and downward through foul-air ducts, which unite in the cellar and are connected to suction shafts in the foundation of the tower, up through the walls of which the shafts are carried, leading into the four tubular wrought iron pillars of the crest of the tower. Two electrically driven exhaust fans draw the impure air through these foul-air shafts and discharge it into the atmosphere from the apex of the tower at a distance of about 87 m. (285 feet) above the sidewalk.

The fresh air is admitted to the rooms through registers near the ceiling, and the impure air is drawn out through registers near the floor. These registers consist of louvres, set in iron frames, by means of which the amount of opening can be regulated, the full opening being secured and the ducts cleaned by taking the louvres out.

As a result of a prize competition, the contract for the system of heating and ventilation above described was awarded jointly to Rud. Otto Meyer of Hamburg, and David Grove of Berlin, their designs being of equal merit.

A non-conducting covering for boilers, steam pipes, etc., recently patented by a Canadian inventor, consists of mica, soapstone, molasses, and bicarbonate of soda, combined in specified proportions.

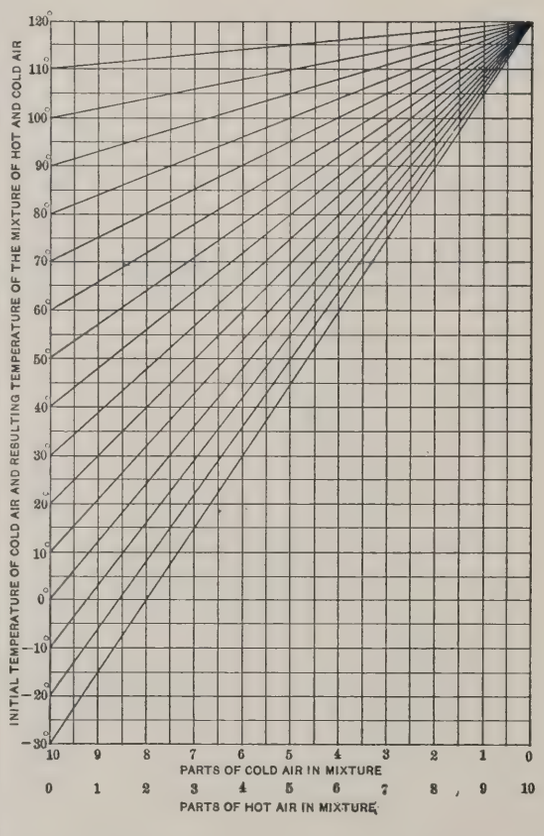
Pumps should always be drained in cold weather, as freezing of water in pipes or cylinders is sure to burst them. Engineers should therefore be careful and open the drip plugs and cocks which are provided on all pumps for draining them.

Hot and Cold Duct System of Hot Blast Heating.

Walter B. Snow

Perfect ventilation demands that the air supply shall be constant for a given number of occupants, while satisfactory heating, on its part, requires that the temperature of the air thus admitted shall be capable of regulation without affecting the volume. It is obvious that this can be accomplished only by some arrangement or device independent of the appliances introduced for the purpose of ventilation proper.

One of two methods must be adopted. Either the total volume of air must first be tempered to a degree slightly less than that of the apartments to be warmed, and then heated to any further degree by supplementary coils (one or more to each apartment), or variation in the temperature of the entering air must be secured by mixing hot and cold air in the proper proportions. The latter arrangement has been largely introduced in connection with the blower system, particularly where blower and heater are of the ordinary marketed types.



The device has been tried of extending the hot-air pipe up into each vertical flue, and so shaping its end and that of a direct outdoor cold air connection, that an aspirating action is produced like that of a feed water injector, drawing the cold air into the flue and there mixing it with the hot air before it enters the room. No marked success in practical results has attended experiments with this device. Simpler and almost universally employed when hot and cold air are to be mixed is the double duct system direct from the heater. That is, two parallel ducts are so arranged at their connection with the hot blast apparatus that one receives only air that has been passed through the heater while the other is supplied with cold air that has been by-passed around the heater, thereby avoided heating, or perhaps heated or tempered to a temperature slightly below that desired within the building. Whether the by-pass shall be above, below, or to one side of the heater depends upon the arrangement of the apparatus, but it is obviously necessary that the fan should be arranged to force the air through the heater.

With this arrangement there is employed at the base of each flue where the two ducts connect a mixing damper so designed as to close the cold air supply as the warm air is increased, or vice versa, but always in such relative proportion as to maintain a constant total or aggregate volume. Mixing damper designs are numerous, but in this particular case do not concern us. It is necesssary, however, that they should be accurate in the relative proportioning of the air volume, and above all that they should be so constructed as to be capable of being closed practically air tight against the cold air supply when so desired, unless the so-called "cold" air is previously tempered.

In a failure to accomplish this where untempered air is supplied to the cold duct lies one of the most evident causes of unsuccessful operation with some hot blast systems where this hot and cold arrangement has been introduced.

An incorrect relative proportioning of the hot and cold ducts themselves has likewise been the cause of considerable trouble. Some of the earlier systems were planned with cold air ducts one-half or two-thirds the area of the hot air ducts. It appeared upon practical operation that the difficulty arising was due to the incapacity to cool rather than to heat certain rooms. For instance, in a school house upon a day when the thermometer stood outside at 45 to 50 degrees, it was impossible to secure a large enough proportion of cold air in the mixture to rooms over the boiler or on the sunny side to prevent their being overheated. Where the temperature of the hot air from the heater was reduced sufficiently to give the proper temperature to the mixture for these particular rooms, it was found that those upon the opposite side of the building were insufficiently heated. As a consequence, in recent installations the cold air duct has been given the same area as that designed to convey the hot air. Under this arrangement it is possible to supply to the rooms air of the same temperature as that out of doors, plus what-

ever slight increment it may receive in its passage through the ducts.

An accurate calculation of the resulting temperature when two known volumes of air of different temperatures are mixed must take into consideration the temperature, weight, and humidity of these volumes, but for rough estimating and for purposes of comparison, the difference in weights and humidity may be disregarded. It then becomes merely a question of averaging of the simplest kind. Thus, for instance, if of a stated resulting volume 4 parts were introduced at a temperature of 30 degrees and 6 parts at a temperature of 120 degrees, the calculation would be merely

$$\frac{(4 \times 30) + (6 \times 120)}{10} = 84 \text{ degrees.}$$

In this manner the accompanying chart has been laid out simply to illustrate the relative mixtures and resulting temperatures under a given set of conditions. As a fair basis, under ordinary circumstances, 125 degrees has been taken as the initial temperature of the hot air in its relation to various proportional mixtures with cold air at 30 degrees up to 120 degrees. Of course the terms "hot" and "cold" become here distinctly relative; in fact, they always are.

The vertical lines upon the chart represent the relative proportions of hot and cold air as indicated by the figures at the bottom, while the horizontal lines serve as measures both of the initial temperature of the cold air and of the resulting temperature of the mixture. Thus, taking the illustrative case above, the proportion of 4 parts cold air and 6 parts of hot air having been found at the bottom, the vertical line thus indicated is followed upward until it intersects with the inclined line which terminates at the left in the point 30 degrees. Following across horizontally to the left from the first point of intersection the temperature of the mixture may be read off.

As already stated, the correction for change in weight due to change in temperature has not been applied, but the chart shows, nevertheless, the results of the given conditions in a manner sufficiently accurate to facilitate ready comparison. Of course the cold air figures refer to the temperature of the air as it enters through the mixing damper. What its temperature might have been before entering the apparatus must depend largely upon the arrangement of the system and the total amount of cold air passing through the mixing damper at the time. Crudeness in design and installation is giving way to perfected arrangements. The thermomstat is taking the place of the individual in controlling the mixing damper, and hence the temperature, while a class of janitors and engineers experienced in the operation of the system is arising, and the next decade bids fair to show a large increase in the number of hot blast systems in which the hot and cold duct arrangement in some form is satisfactorily operated.

Hot Water Heating.

The hot water heating system has very justly merited a large share of the attention of the public during the past few years, and is growing in public favor, nor is this growth to be wondered at when you consider the many points of merit which the system possesses.

The temperature of steam at atmospheric pressure is 212 degrees F., and while there have been many ingenious devices designed or invented and patented for the purpose of regulating or diminishing the temperature or heat given off by a steam-heating apparatus in moderate weather, they have all proved failures, especially when in the hands of the ordinary inexperienced help who have charge of nine-tenths of the heating apparatus placed in private residences.

The variation of temperature which can be obtained in a steam heating apparatus, from atmospheric to five pounds pressure, is 15½ degrees, while a low-pressure hot water heating apparatus can be run (and will do effective work in heating buildings) from 100 to 235 degrees F., or a variation of 135 degrees; so that a steam plant designed of ample capacity to thoroughly heat a building in zero weather, will overheat it to an uncomfortable degree in moderate weather, without the possibility of being able to regulate it except by completely closing off the radiator or coil, making an uneven temperature; while a hot water heating plant, of ample capacity to heat a building to say 70 degrees in zero weather, can, by simply reducing the fire and regulating the dampers, be arranged to maintain a uniform temperature of 70 degrees when the thermometer outside registers 10, 20, or 30 degrees above zero, and this result can be obtained by the ordinary help.

The fact that you can, by reducing the fire in a hot water heater, reduce the temperature evenly throughout the apparatus, coupled with the fact that two-thirds of the weather during our ordinary winters is moderate, when you require only a moderate degree of heat, is the real secret of the positive economy of fuel which can always be found in a properly designed and constructed hot water heating apparatus over any other mode of heating; and while, during an experience extending over a period of twenty years, I have seen many hot water apparatus which were not economical in fuel, and some which were positively wasteful, I have always been able to trace the cause to any one of three things: either the heater was too small for the work and had to be forced; or it was faulty in construction, having an area of grate surface out of all proportion to the fire surface, thereby allowing a large amount of the heat generated to pass off into the smoke flue without being utilized in heating the water; or, the flow and return mains were so placed and of such sizes as to prevent or retard the circulation of the water. Then the third cause has been in the radiating surface; it has either been of poor construction, improperly located, or it is of such size as to be altogether inadequate for the purpose for which it was designed, and if a person must err in proportioning radiating surface, I would advise him to err on the safe side, for the most fatal error in hot water heating is to place too little radiating surface and be compelled to run the apparatus at a high temperature in order to properly heat the rooms, thus robbing the system or apparatus of one of its strongest claims, namely, economy in fuel, and making it necessary to attend to the fires oftener than if the water was carried at a lower temperature. The most economical hot water apparatus which have come under my notice have been those which were so proportioned as to thoroughly heat a building in the coldest weather with the water in the system carried at a temperature not to exceed 180 to 190 degrees F.

There are three different systems of radiation which can be used in connection with a hot water heating apparatus, namely, direct radiation, direct-indirect radiation, and indirect radiation. Of these three, the direct system, which is placing radiators in the several rooms and halls to be heated, is the most popular, and is the system most generally used, as it can be placed at less cost than either of the other two systems and is a very efficient mode of heating, though it makes no provision for ventilation.

Until within a few years the demand for a hot water radiator was so small that while steam radiators were made in endless variety, there was no such thing as a hot water radiator, and what was generally used was box or wall coils of 1-inch or 1¼-inch wrought iron pipe. When it was desired to improve the appearance of box coil it was usually surrounded by a cast iron screen of ornamental design, surmounted by a marble top, and the wall coils were sometimes ornamented by the use of rosette plates.

The placing of a screen and marble top over a box coil retarded the flow of air over the heated surfaces and made a receptacle for carpet sweeping and dust; and while a wall coil could be made very presentable it was sometimes objected to on account of the size necessary to get the required number of square feet of surface to heat a given amount of space.

Within the last five or six years there have been a large number of designs of hot water radiators brought into the market, and within the past two years there has been considerable rivalry among radiator manufacturers as to which could bring out the most ornamental design, until to-day there are designs of hot water radiators to suit the most fastidious taste. They vary in efficiency for several reasons, some because they do not contain the number of square feet of surface that is claimed for them, and others because, while they have the surface claimed for them, that surface is so

placed or located that the air cannot or does not circulate over it, so that it is only effective up to the full amount of efficient surface it contains.

My opinion regarding low temperature and low pressure hot water radiators (and I think I can safely say the opinion of all hot water heating engineers of large experience, who have gained their experience not from theory or books but from actual practice in placing the system), is, that extended surface radiators, or radiators having fins or pins, or bars, cast on, to increase their surface, and having no water inside of those projections, should not be used for hot water heating, either for direct, direct-indirect, or indirect radiation; for the reason that they are not effective in proportion to the amount of surface claimed for them, and are only effective to the extent of the plain surface which they contain.

I anticipate criticism on this point, but as I have my own opinion, which is based on a long and successful practical experience in placing the system, and also the opinion of the leading engineers who have been actively employed in placing the system for the past thirty years, I am prepared for any criticism which may arise from any assertions I have made or may make on this subject.

Regarding the best style of direct radiation to use in connection with a hot water heating apparatus, I would say that radiators are now made with a base and top; without a base but with a top, and without a base or top; of plain and ornamental design; some put together with all screwed joints; some with one screwed joint and one washer joint; some with all washer joints, and some with ground tapered joints. Any of them, provided they have the surface and free circulation of water, and are placed of ample size, will do the work required of them. I would favor those having screwed joints, especially in large radiators, for the reason that the continued expansion and contraction on a vertical section radiator will eventually make a radiator with washer joints leak, while a screwed or ground joint once made tight will remain tight for all time.

Direct-indirect radiation is placing the radiators in the rooms to be heated similar to direct radiation but having a metal air pipe from outside the building to a point immediately below the radiator, as a means of ventilation. The air pipe should have a valve for regulating the supply of air, and the radiator should have a boxed base extending down to the floor line.

The same remarks I have already made regarding the efficiency of radiators will apply to this style of radiation, except that the surface should be increased 25 per cent over that used for direct radiation. I find 20-inch area of air pipe ample for 100 feet of direct-indirect radiation.

Indirect radiation is the placing of radiators in tin-lined pipes or metal casings in the basement or cellar of a building, supplying them with cold air by means of a cold-air duct from outside of the building or from a central air chamber, which in turn is supplied with outer air by means of one large cold-air duct, which should be equal in area to the total area of all the branch air pipes leading from the chamber to supply the several indirect radiators with air. The best results are obtained in indirect heating when separate indirect radiators are placed in the basement or cellar for each room to be heated, with separate hot air pipes, cold air supply, and registers.

Some heating engineers place the indirect radiating surface necessary for a number of rooms in one or two large brick-cased stacks in the basement or cellar, taking hot air pipes from the stacks to the several rooms to be heated; but while this method slightly reduces the cost of the apparatus, there are many serious objections to its adoption, the principal one of which is that its operation is affected by the winds, making a varying temperature in different parts of the building, and making it impossible to heat certain rooms in certain winds. Then, again, the ventilation in all the rooms is not generally alike, some ventilating shafts having stronger drafts than others, making it possible to overheat some rooms, while others are inefficiently heated; whereas, if the radiating surface for each room was properly proportioned, and so placed and connected that the heat could not be drawn to any of the other rooms, it would insure a uniformly heated building.

I have experimented with the different constructions of cast iron extended surface indirect radiators in connection with low pressure hot water heating apparatus, and find that they answer fairly well when placed of ample size and used for ventilating purposes only, but when it is intended to heat a room entirely by indirect radiation I find that the best results are obtained by using box coils of 1¼-inch, or 1½-inch wrought-iron pipe, containing the required number of square feet of surface, and that four feet of this surface are equal to six feet of cast iron extended surface.

The system of radiators that I would recommend in connection with a hot water heating apparatus is direct radiation for heating purposes, with sufficient indirect radiation to insure perfect ventilation. Indirect radiators will not give satisfactory results unless there are ventilating registers or fire-places in the rooms with which they are connected.

I find that the proper area of cold-air pipe necessary for 100 square feet of indirect radiation in hot water heating is 75 square inches, while the hot-air pipe should have at least 100 square inches of area. There should be a damper in the cold-air pipe for the purpose of controlling the amount of air admitted to the radiator depending on the severity of the weather.

Regarding a proper arrangement of mains for a hot water heating apparatus, I would say that there are two different systems of mains in general use in connection with the system, either of which, if properly arranged, will give good satisfaction. One is the taking of a single large flow main from the heater to supply all the radiators on the several floors, and a corresponding return main of the same size. The other is the taking of a number of 2-inch wrought-iron mains from the heater, with the same number of return mains of the same size, branching off to the several radiators or coils with 1¼-inch, or 1-inch branches, according to the size of the radiator or coil. A 2-inch main will supply three 1¼-inch or four 1-inch branches, and these branches should be taken from the top of the horizontal main, with a nipple and elbow except in special cases where it is found necessary to retard the flow of water to the near radiator for the purpose of assisting the circulation in the far radiator. In this case the branch is taken from the side of the horizontal main. The flow and return mains are usually run side by side, suspended from the basement ceiling, and should have a gradual ascent from the heater to the radiators of at least one inch in ten feet. It is customary, and an advantage, where 2-inch mains are used, to reduce the size of the main at each point where a branch is taken off thus: If your main is 2-inch and you take off a 1¼-inch branch, the main should be reduced in size after it passes the branch to 1½ inches; and where the next 1¼-inch branch is taken off, the main should be reduced to 1¼ inches, which would be carried to the last radiator. This will apply to almost all cases in ordinary house heating, except in very special cases, where the horizontal mains in the basement are extremely long, when it is necessary to carry the 2-inch main to the second branch, there reducing it to 1½ inches, to be carried to the last radiator, supplying each of the three radiators with 1¼-inch connections.—Ex.

For a cement to fasten iron to stone, take 20 parts iron filings, 60 parts of plaster of paris, and 1 part of sal ammoniac; mix with weak vinegar to a fluid paste and apply at once.

What is known as "aluminum bronze" has 10 per cent. aluminum and 90 per cent copper, and possesses a tensile strength of 90,000 pounds, an elongation of 15 per cent, and will cast, forge, roll, draw into wire, or work in a lathe about as well as steel.

Speaking recently at a meeting in Newcastle, England, Sir Robert Ball, the Astronomer Royal for Ireland, hinted at the approach of a time when posterity might construct machinery that would be operated with heat obtained by the direct action of the sun's rays. He showed on a screen a machine which, by means of a reflector, heated the water in a boiler large enough to generate the steam required to work a small press.

Practical Ventilation Work.—II.

BY VENT.

In this article I shall describe the system of ventilation employed in ventilating 112 sleeping apartments, in the dormitory of the Drew Seminary at Madison, N. J., showing the mechanical features in putting up work of this kind.

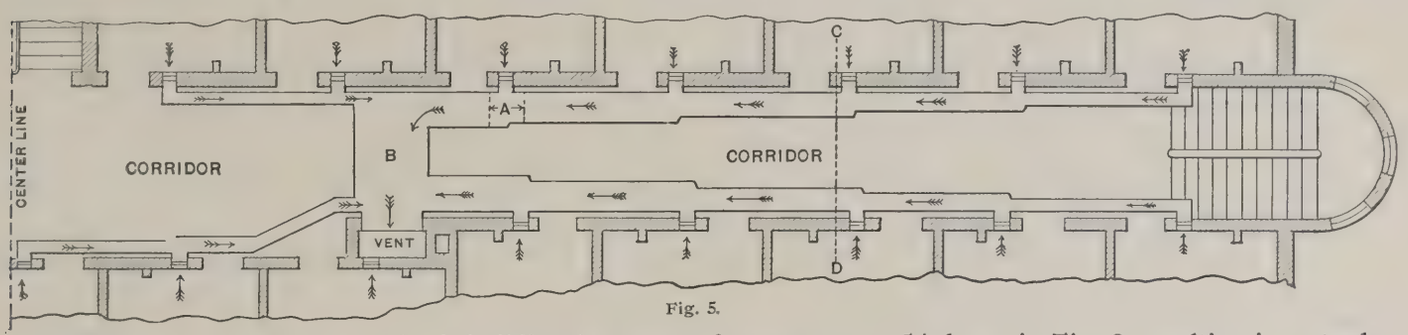


Fig. 5.

Referring to the diagrams, Fig. 5 shows a half plan of galvanized iron ventilating ducts, which are fastened to the ceilings of the first, second and third floors. The center line shown in Fig. 5 represents the center of the building, the other half of the building being exactly the same as the half shown. As will be seen by referring to Fig. 5 the width of the ducts increases according to the number of the rooms connected to them. Where the four lines of ducts meet together they are connected to a large air chamber which is indicated by *B B* in Figs. 5 and 6, and which is in turn connected to the brick ventilators as shown.

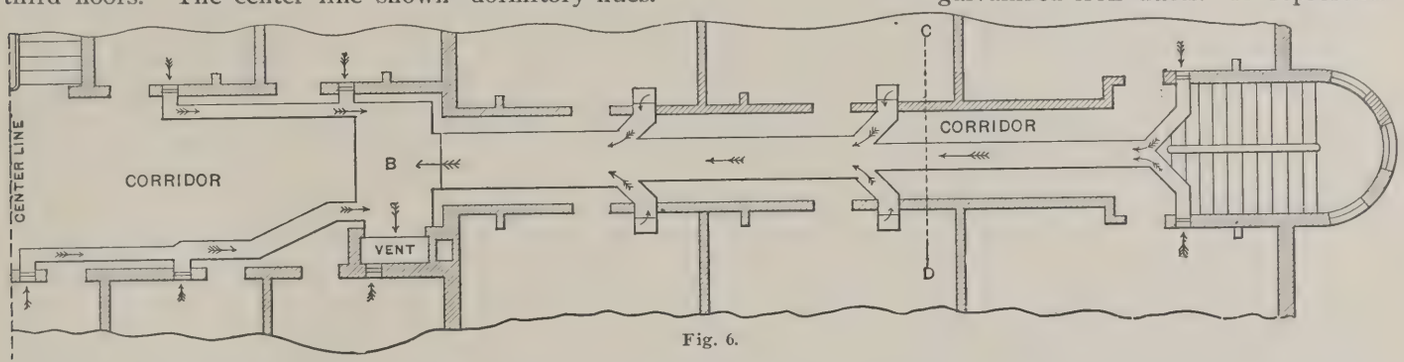


Fig. 6.

In Fig. 5 the registers are placed in the brick walls, while in Fig. 6, which indicates the half plan of the fourth floor, the registers are partly placed in the brick walls and ceilings, as shown. Each room contains a large window facing the open country. A rear extension built exclusively for the water closets, is connected to the main building by means of passageways, 5 feet in length; the closets being ventilated separately by means of a brick ventilator, similar to that shown in Fig. 8, thereby avoiding the danger of having the closets connected to the dormitory flues.

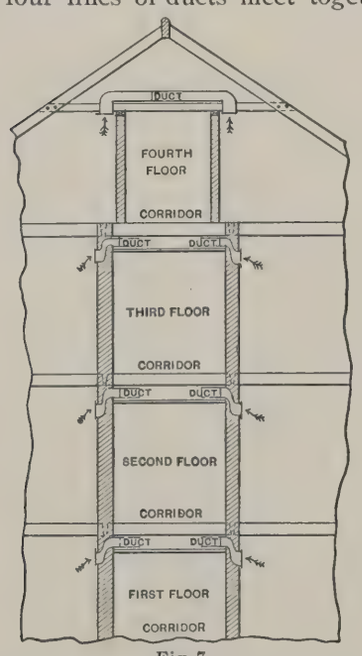
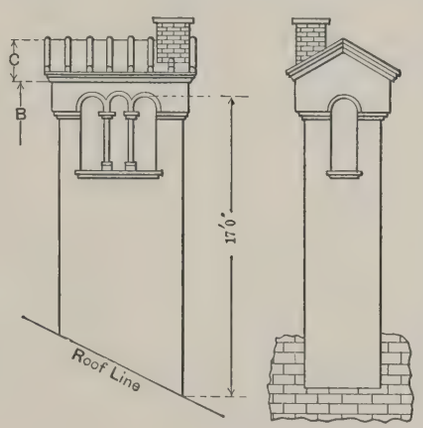


Fig. 7.

Fig. 7 is a section of the building taken on the lines *CD* in Figs. 5 and 6, showing the positions of the galvanized iron ventilating ducts on the ceilings. As will be seen, galvanized iron goose-necks or register elbows are built into the wall as the building progresses, and are afterwards connected to the ducts. In the fourth floor register boxes are fitted into the ceilings as shown, then afterwards connected to the ducts.



Figs. 8 and 9.

Fig. 8 is a front view of the large brick ventilator and chimney, while Fig. 9 is a side view. The height of the ventilator from the top of the slate roof to the top opening of the ventilator is 17 feet; the brick work runs up as far as the arrow line *B*, while the roof is of copper, as indicated by *C*. The ventilator has openings on all four sides; therefore, no matter which way the wind blows, a draft is assured.

The rooms are warmed by means of fresh warm air, which is forced in near the floor, the vitiated air being exhausted through the ventilating ducts by the large brick ventilator shown in Fig. 8, resulting in a steady circulation. The exhaust can be regulated by means of a damper in the register. In Fig. 10 is shown the method of making air-tight connections between the brick walls and the galvanized iron ducts. *A* represents the metal goose-neck, which is built into the wall, with a beaded edge *B*, which is allowed to project over the wall as much as is required for the thickness of the furring, lath, and plaster. The other end of the goose-neck projects about two inches over the wall line and is connected to the ventilating duct. An outward flange about three inches in width is bent into the duct, which is connected over the goose-neck as shown at *CC* in Fig. 10, and then nailed to the joints of the brick work.

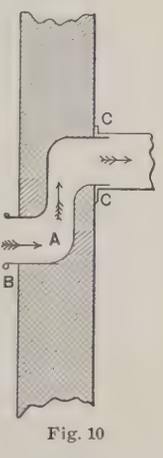


Fig. 10

To make the joint absolutely air-tight, the flange of the duct is well paint-skinned to the brick work, which makes an air-tight job. In

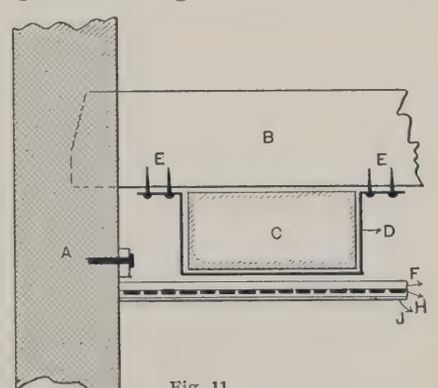


Fig. 11.

Fig. 11 is shown the method of putting up the galvanized iron ventilating ducts. *A* represents the brick wall and *B* the wooden beam; *C* represents the galvanized iron ventilation duct secured to the wood by band iron $\frac{3}{16}$ of an inch by one inch in thickness as indicated by *D*. Quarter-inch holes are punched into the band-iron braces and they are fastened to the wooden beams as shown by *EE*.

After all of the ventilating ducts are put up, a ceiling is made under the ducts, hiding them completely. The duct *C* in Fig. 11 should always remain from 6 to 10 inches off the wall so as to admit of fastening the band-iron braces and nailing the furring strip. *F* represents the furring strip, *H* the lath and *J* the plaster.

It is usual in a large ventilation job of this kind to prepare the elbows, reducers and chambers in the shop. To illustrate, *A* in Fig. 5 represents a reducer, the dotted lines indicating how long the reducer is prepared in the shop, the straight ducts being connected at the building. Thus, in a job of this kind the mechanic who prepares the work from the plans, numbers the different elbows, reducers, etc., on his plans, and marks the finished work to correspond with these numbers. Then in case another mechanic puts up the work at the building, he receives a tracing from the original plan, the numbers on which guide him in placing the work in the proper position.

The writer has in mind a ventilation job that was done in a private school on West 59h street, New York, where the ducts were fastened in the manner described in this article, with the exception that an electric fan was used instead of a high brick ventilator. The galvanized iron ducts in this case were all connected to a large brick shaft, extending six feet above the roof, and an electric fan of 48 inches diameter was placed in the side of the shaft, which exhausted the air from the class rooms to which the ducts were connected.

(To be continued.)

The Conference on "Standard Flanges."

At the last convention of the Master Steam Fitters, held in New York, June 19-22, 1894, the matter of changing outside diameters in the table of "Standard Flanges" adopted in 1893 (the change being asked for by manufacturers to save expense of changing patterns and goods), was referred back to the Committee on Standard Flanges with full powers. The members of this committee are E. P. Bates of Syracuse, S. J. Geoghegan of New York, and A. C. Walworth of Boston. The committee at once arranged for a conference with the Committee of the American Society of Mechanical Engineers and the manufacturers. This conference met at the Engineers' headquarters, 12 West Thirty-first street, on July 18, there being some twenty-five or thirty persons present, and was presided over by Mr. Carleton W. Nason, the chairman of the Engineers' committee. A full discussion was had of the question, Mr. Geo. T. Coppins presenting in an able manner the position of the manufacturers, and stating that they wished to adopt the bolt circle, number and size of bolts, etc., as already fixed; but since very many makers of valves and fittings had adopted an outside diameter varying from the standard by a fraction of an inch only, he urged that their figures should be adopted as standard outside diameter. The conference seemed inclined to stand by the original figures, when Mr. A. C. Walworth suggested that a compromise be made on certain sizes, since by so doing he believed all the manufacturers would fall into line and the adoption of a standard flange be hastened several years. He proceeded to tabulate on the blackboard the flanges up to 12 inches, and show the correspondence with or amount of variance from existing practice. This table in part is given below, Mr. Walworth advising the adoption of the full face figures.

Mr. Coppins gracefully stated that the three large manufacturers for whom he held proxies would meet the engineers half way, and moved the adoption of the black figures as the sense of the conference. This motion was unanimously carried, and when adopted and published by the committees, as it no donbt will be, may be considered as settling the question of dimensions of standard flanges. It only remains for manufacturers, engineers and fitters to adopt these flanges as a basis for work and millions of dollars will be saved to the people of the United States. Mr. Walworth's table was as follows:

Diam. of Pipe.	1893 Standard.	Manufacturers' Size.
2 inches.	6 inches.	6½ inches.
2½	6¾	7
3	7½	8
3½	8	8½
4	8¾	9
4½	9¼	9½
5	10	10
6	11¼	11
7	12½	13
8	13½	14
9	14¾	15
10	16	16
12	18½	18

The full face black figures are the size of flange adopted by the conference, and it is probable that new tables embodying these figures will be printed and distributed broadcast by the associations.

It will be seen that no change was made in sizes over 12 inches.

The reasons given by Mr. Walworth for the six changes that were advised were as follows: For the 2½ inch size the increase of ¼ of an inch did away with the fractional diameter, and, while increasing the strength of the flange, brought it in line with two-thirds of the makers of flanges in the United States, including the leading manufacturers. The same is true of the 3½ inch and 4 inch. The change in the 6 inch brings it in line with twenty-three manufacturers, and gets rid of the fractional ¼ of an inch, and the same is true of the 9 inch change as to a majority; while for the 12 inch the increase of ¼ of an inch radius both strengthened the flange and made it conform to the practice of the largest manufacturers.

The Engineer's committee presented carefully tabulated figures of the practice of some forty manufacturers of fittings, valves, pumps and engines, and the final adjustment was made possible by a careful comparison of these figures, so that as little hardship as possible might be caused these makers without sacrificing correct engineering dimensions. The principal dimensions of small flanges as adopted by this conference are given below:

Size of Flange.	Thickness.	Bolt Circle.	Bolts for Low Pressure.
2 x6 inches.	5/8 inch.	4¾ inch.	4-½x2 inches,
2½x7	11-16	5¼	4-½x2¼
3 x7½	¾	6	4-½x2½
3½x8½	13-16	6½	4-½x2½
4 x9	15-16	7¼	4-⅝x2¾
4½x9¼	15-16	7¾	8-⅝x3
5 x10	15-16	8½	8-⅝x3
6 x11	1	9⅝	8-⅝x3
7 x12½	1 1-16	10¾	8-⅝x3¼
8 x13½	1 ⅛	11¾	8-⅝x3½
9 x15	1 ⅛	13	12-⅝x3½
10 x16	1 3-16	14¼	12-¾x3⅝
12 x19	1¼	16½	12-¾x3¾

After adjournment the chairman, Mr. C. W. Nason, invited all present to his bountiful spread down stairs, giving an enjoyable social finish to an important conference.

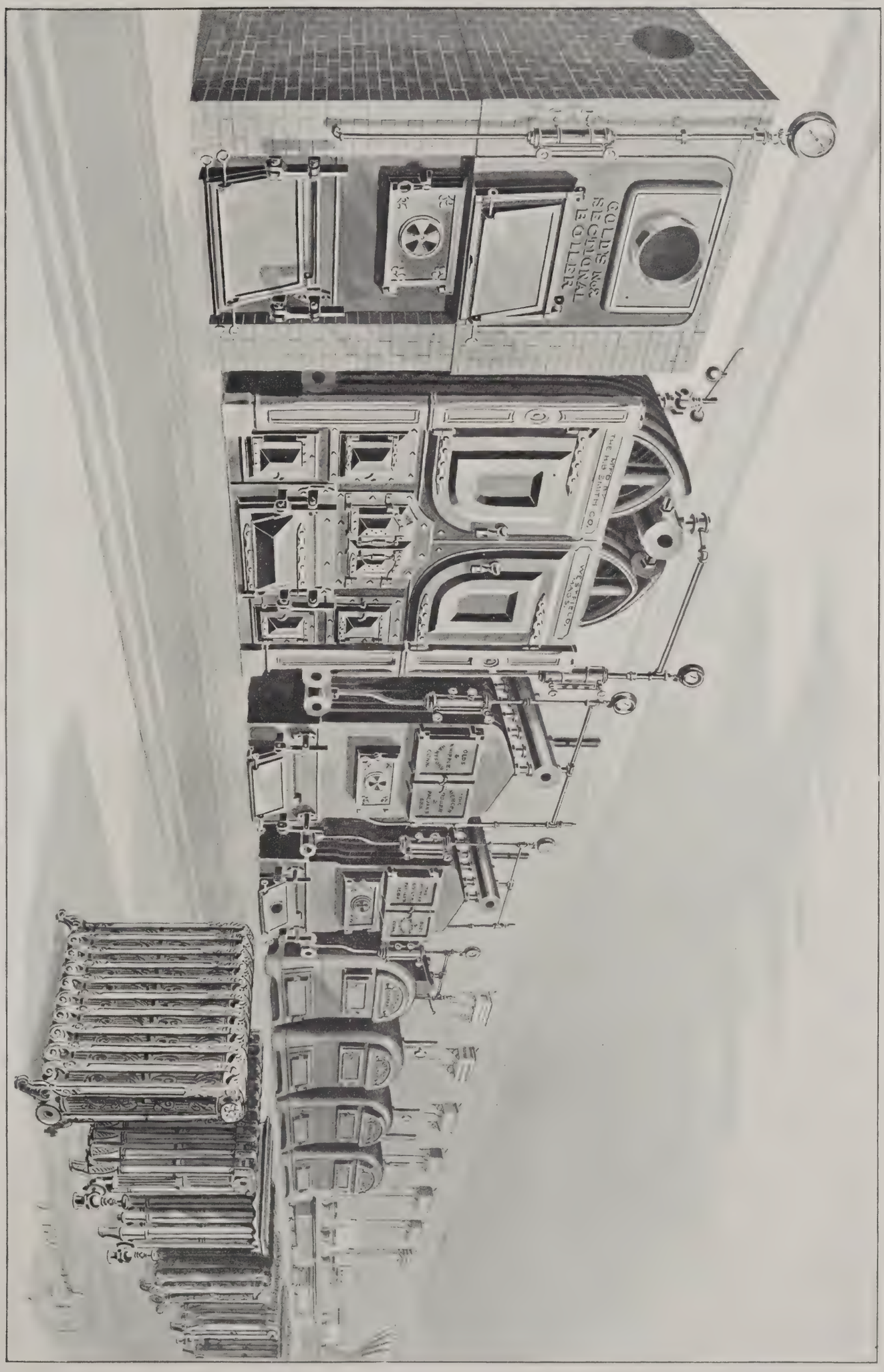
Store of Olds & Whipple.

We show in this issue a full page illustration of one of the most complete displays of heating goods which can be found in the country. The sketch shows the Main street store of Olds & Whipple, Hartford, Conn., who rank as one of the leading heating and plumbing contracting firms in New England.

They have recently extended their business and placed on their floors the line of heating goods shown in the illustration. Their engineer, Mr. L. R. Libbey, has charge of their heating department, and, considering his extended experience and familiarity with all heating matters, we predict an assured success for this branch.

Mr. B. O. Tildon, their sanitary engineer, has charge of their plumbing department, and they can show to their customers a most complete line of plumbing specialties.

In placing a gauge on boilers, it should be so connected as to take steam from a part which will be as free from vibrations of pressure as possible, that is, away from the outlet to the engine, and a siphon should never be omitted. It is also necessary that the gauge shall not be placed at or near the lower level of a connecting pipe which has a drop of any extent, which will create an excess of pressure on the dial by the weight of water in the column. In a battery of boilers there should be a gauge on each boiler and not one gauge for the whole.


OLDS & WHIPPLE'S
SECTIONAL
STEAM BOILER.
THE WARREN FDY & MACH CO
WARREN, MASS.

Construction of Heating Boilers.

BY J. C. HENDERSON.

The construction of a boiler for heating buildings should be adapted to produce the maximum efficiency under the actual and variable conditions involved, and not merely to constant theoretical conditions arbitrarily assumed. The conditions involved in economically generating steam for power are quite different from the conditions involved in economically generating steam for heating buildings. A suitable boiler should be of the most simple and compact construction, and capable of economically generating steam for several hours without attention. The changes in the weather being frequent and variations of temperature often large, the quantity of steam generated must vary largely and without frequent stoking.

Boilers may be divided into two general classes, viz., those in which gases highly heated in a combustion chamber pass over large heating surfaces, suitably located to absorb the heat above a certain limit of temperature at which the gases must necessarily pass off through the chimney, and those in which most of the heat of combustion is directly absorbed by heating surface in actual contact with the burning fuel and other heating surfaces, suitably located to absorb the heat radiated directly from the fire.

In the first class the efficiency varies with the ratio of the initial temperature of the gases when they arrive at the heating surface, minus their temperature when they leave the heating surface, to the initial temperature of the gases as before stated; and consequently the fire cannot be regulated to correspond to the large variation in the demand for heat without a large loss of efficiency.

In the second class the efficiency is nearly constant with a variable fire, because whatever the degree of fire maintained, the heat developed is absorbed directly from the fire, and the gases leave the combustion chamber at a minimum temperature.

With a deep fire pot utilized as heating surface, a large mass of fuel can be maintained at the variable rate of combustion necessary to develop the amount of heat corresponding to the variable demands for heating buildings with a medium amount of grate surface, because air cannot pass into the combustion chamber through the grate any faster than the gases escape through the chimney.

Any desired rate of combustion (to be regulated automatically) can thus be maintained economically twelve hours or more without attention. Good combustion is continuously maintained, because the large mass of burning fuel remains at a high temperature when the escape of gases through the chimney is lessened to reduce the rate of combustion and the amount of heat evolved; and, as before shown, the supply of air is ample.

With a shallow fire box and large grate surface the combustion will be good with a strong chimney draft. But when the escape of gases through the chimney is lessened to reduce the rate of combustion and the amount of heat evolved, the thin layer of coal on the large grate surface will rapidly lose temperature and the combustion will be poor.

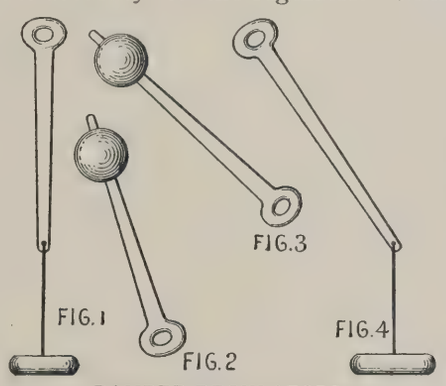
It is obvious that a small surface suitably located to absorb directly the heat from the fire will be as efficient as a surface many times as large which is suitably located to absorb heat from the gases which are heated in a combustion chamber and passed over it; and that an efficient boiler of the second class can be made in a compact form, which is impossible for boilers of the first class.

Damper Regulators.

BY W. H. WAKEMAN.

There are several very good damper regulators in the market at the present time, and also some poor ones. If a man has a good one it is not necessary to tell him of it, but if he has a poor one a few suggestions as to how its action may be improved will be of interest.

Fist-class damper regulators are positive in their action, and by this we mean that if the damper is not balanced, or even if a heavy weight is hung on its lever to make it open properly, it will not interfere with the accuracy of the regulator. Still



DAMPER REGULATORS.

there are others which are quite sensitive in their operation when not connected to the damper, but when they are in use they require a variation of perhaps 10 pounds to make them work. This can be improved by balancing the damper by means of two levers and small weights, as follows.

When the damper is open the lever and weight on one side stands in the position shown in Fig. 1. At the same time the lever and weight which is attached to the other end of the trunnion which supports the damper stands in the position shown in Fig. 2. From these illustrations it will be seen that Fig. 1 has no tendency to move the damper in either direction, but Fig. 2 has a slight tendency to close it, but not enough to move the regulator. As the fires are now burning brightly the steam pressure is raised and the regulator closes the damper. Fig. 2 is then changed into the position shown in Fig. 3, so that it now brings quite a strong leverage to bear on the damper, but at the same time Fig. 1 is changed into the position shown in Fig. 4 and thus counteracts the leverage of Fig. 3. It is an easy matter to balance a damper in all positions, but in changing from Fig. 1 to Fig. 4, we get the same results as would be secured by shifting the weight on a nearly horizontal lever, and this is done automatically.

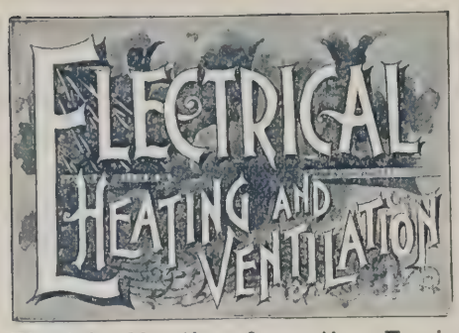
There are many cases in which the old fashioned diaphragm regulator can be made to do much better work than it is doing, provided certain well-known principles are regarded. To commence with, the lever on the damper is usually too short. If we have a heavy weight to raise, we get a long lever to do it with, for it follows in all cases that the longer the lever is the easier will the weight move; therefore when we have a damper to move we should get as long a lever to operate it with as possible. The length of the lever that we can use may be determined as follows:

Place the lever on the damper regulator in its highest position, and then in its lowest place, and note the distance that it travels. Suppose that it is 12 inches. We will now make a long lever and put it on our damper when it is closed, and then bring it up until the damper is wide open. Now there is a place somewhere on this lever that travels just 12 inches, and as this represents the travel of the regulator, here is where a hole should be bored in the damper lever and the connection made to the regulator. If it is necessary to use one or more pulleys to connect the two, they should not be less than about six inches in diameter, and a cotton or wire rope passed over them. Never use a chain for this purpose as the links cause too much friction. Keep the bearings well oiled and free from dust, and while this regulator is not especially recommended, still it will prove much better than none.

There is no substance like spring steel to give the greatest strength with the least material.

Be sure and have your suction pipes perfectly tight as it may cause great trouble with your lifting either with pump or injector. When your pump or injector will not lift this is the first place to look for trouble, and you will usually find it here.

A method of using coal dust without special preparation is being tested by two Berlin engineers, Wegner and Baumert. By means of a funnel provided with an agitator at the bottom the dust is made to enter an air-tube, whence it is carried to the furnace by a current of air, which also works the agitator. The furnace is lined with bricks, and the incandescent partitions cause the rapid and complete combustion of the coal dust.



Electric Heating from the Engineering Point of View.*

BY W. S. HADAWAY, JR.

In considering the generation of heat by electricity it has been customary for electrical engineers to regard this product as waste. The question arises whether this form of energy, which is always an adjunct to other forms of electrical action, in a greater or lesser degree, may not be utilized for commercial applications of heat, either in itself or by using the same source of supply for this purpose directly, when not in use for light or motive power.

The present system of incandescent lighting is a typical example of electric heating. A carbon filament of high resistance in a medium of small heat capacity is employed, and the energy localized at high temperatures to produce what is popularly termed "white heat," about 95 per cent of the energy used passing off directly as heat, and the balance as light. Considered in terms of efficiency, incandescent lighting utilizes only about 5 per cent of the dynamo output.

We are familiar with the value of the by-products from the destructive distillation of coal when used in the manufacture of illuminating gas. Heat from electricity cannot be classed as a by-product, for every manifestation of energy from electricity has an exact mechanical equivalent; but we should more carefully examine the factors entering into the production of electricity to apply the heat from electricity itself to useful work and utilize more economically the enormous heat wastes from the fuel burned in its generation.

Inspection of the figures presented before the National Electric Light Association, giving the equivalent in watts of a pound of coal, is strong proof of the statements just made. One factor, frequently overlooked in this connection, is the time of operation and the contour of the load line. There are few electric street railway companies that could exist if they had to charge to their operating expenses power generated at the average cost shown in the statistics of electric light stations.

In entering upon a discussion of electric heating as the art is to-day, we have three sources of supply to consider. First: The street railway plants, in which the power is figured at a comparatively low rate. Second: The electric lighting plants, in which the power is figured at a comparatively high rate. Third: Isolated plants, in which power is figured at cost, and which in most cases is a clear gain on money invested for light and power purposes. In the first case the introduction of electric heating does not affect the time of operation and offers no direct aid in increasing working efficiency. In the second case the introduction of electric heating increases the period of output, is utilized most extensively at period of least present load, and consequently increases working economy of the plant.

Technically, as compared with heat energy, electricity is high potential kinetic energy. In the ordinary processes of concentration from burning coal we lose 93 per cent and secure for useful work, capable of transference from source of supply, 7 per cent. For commercial practice in heating processes we have to balance 35,000 units of heat on the one hand with 2,565 heat units on the other, and determine whether the concentrated form for high and low temperature work, with its comparatively small quantity, possesses sufficient value, by reason of its high potential form, to be commercially comparable with lower potential forms, but greater quantities.

The common method of securing high temperatures is by the application of flame. For proper combustion the ordinary flame has to be supplied with abundance of air or oxygen. The products of combustion pass off at high temperatures, setting up convection currents, which materially lower the potentiality of the heat. It has been shown experimentally that the heat units per pound of complete fuel, the tests including coal, coke, petroleum, wood, illuminating gas, and gunpowder, are practically the same. From fuel burned directly the highest absolute temperature we can hope to attain is nearly 4,000 degrees F., and the efficiency will not exceed 87 per cent.

With electricity as the source of heat the temperatures attained are only limited by the cohesion of matter. There are no excessive waste convection currents; the heat can be applied to a properly selected centre of distribution, and radiated equally in all directions from the centre. It is this feature of localization that commends it as a heat supply in domestic use and a vast number of industrial operations.

There are three methods by which electricity may be employed for heat purposes.

1. Directly,—the entire heat being supplied by degrading electricity through a resistance.

2. Indirectly,—electricity being employed as an agent in operating a heat engine.

3. In combination,—the heat of resistance raising a combustible to the point of ignition.

Heat generated by the first method is generally applicable to localized heating at high temperatures and in some instances to diffused heating, which will be cited farther on. The second method is applicable to that class of work where large quantities of heat are required at comparatively low temperatures, as in house heating. The third method is used in high temperature furnaces for muffle and crucible work, where a considerable quantity of heat is wanted at a very high temperature. I shall confine myself in this paper to consideration of the first method. Practically little or nothing has appeared in commercial work of the second method, though its importance in the development of water powers, as at Niagara, for instance, is well nigh incalculable.

We have already seen that we have three sources of supply of electricity available at present: Street railway power stations, electric light and power stations, and isolated plants, and it is on the circuits of these stations that we must look at the outset for the applications of the first method of heating. On street railway power circuits the only application available on a large scale, outside of electric welding, is in car heating

A great deal has been said concerning this method of car heating that is misleading. It has been stated that electric railway companies could get a better income by selling their power at 2 cents per kilowatt and heating their cars by stoves. A report written for the Street Railway Convention last fall urged the adoption of stoves in preference to electric heaters.

In heating public buildings, schools, steam cars, and dwellings we have reached the point where an equable diffusion of heat is demanded, as it is safer, more comfortable, and conduces to better general sanitary conditions. This distribution of heat either by steam, hot water, or hot air is easily and economically arranged where the space to be heated is large. But in a street car, where the space to be heated is relatively small, such systems are not feasible.

The very fact that makes the operation of an electric street railway possible, makes it possible to secure an equable diffusion of heat by the use of electricity. We find power figured as low as $2 per horse-power per month, and the figures given as the cost "per carmile" in many instances appear to be figured on a basis as low as this. An expenditure of 100 watts per square foot bronzed or dull black radiating surface, will maintain that surface at 135 degrees F. above the surrounding air. The area of radiating surface for proper heating will of course vary with the size of the car and latitude. In cars heated the past winter, 27.5 square feet of surface were found sufficient to properly warm a well built 20 foot car.

On a basis of $2 per horse-power per month, the cost of operation would be about 27 cents per day. But in practice it was found unnecessary to run more than half the radiating surface provided a considerable portion of the time, bringing the average operating cost at about 20 cents per day. In other words, in this case we

*Abstract of a paper read before the New York Electrical Society, at Columbia College.

secured a proper diffusion of heat by electricity, and the cost of operation was only 20 cents per day, while it is conceded that a stove will cost 15 cents per day to operate. The difference between the two costs surely does not compensate for foul smelling cars, unevenly heated and a menace to health, as when heated by the slightly cheaper stove.

There are many forms of car heater upon the market, but we have seen that diffusion of heat is one of the chief pre-requisites of an electric heater in operation. It will generally be found that the heater which fulfills this requirement most completely is the more economical in operation. The greater the expenditure of energy by radiation and the less by convection currents the better. A convenient form in practice is a thin iron pipe with a properly insulated and distributed resistance on the inside, attached to the riser beneath the seat and heated to about 185 degrees F. Of course if cars were subject to no drafts, one form of heater would ultimately be as good as another with the same energy expenditure. But thermometers placed in various parts of a car frequently show differences in temperature of 5 degrees F., and while as a usual thing in space heating, the hotter the source the greater the efficiency, in car heating the greater the percentage of heat we can diffuse in the lower part of the car, in preference to the upper part, the better.

I therefore claim for the electric car heater the same high-grade heating results in small drafty cars as we secure in carefully arranged heating plants of large dimensions,—a large quantity of air moderately heated and consequently good ventilation. These factors warrant the use of electric heaters in preference to stoves, even at a very largely increased cost.

The main sources of supply of electricity for industrial and domestic applications are the electric light and power stations and isolated plants. It is in conjunction with the use of the station equipment for lighting and power that electric heating develops maximum station efficiency. I have already alluded to the inefficiencies of these stations as reported recently before the National Electric Light Association. Careful study of the reports of the Massachusetts State Board of Gas and Electric Light Commissioners, gives us the practical results of this manner of operation. These reports show that the money invested in electric stations, and particularly the smaller ones, is not properly remunerative.

Professor Thurston shows an average boiler efficiency of about 65 per cent as the results of many series of tests, and some very good boilers have been found to exceed seventy per cent efficiency. The efficiency of a perfect engine working between the boiling point and the freezing point of water is $\frac{100}{374}$.

In practice it is impossible to keep the condenser at a much lower temperature than 110 degrees F., which at average pressure gives a theoretical efficiency of about one-fourth. In practice one-half this efficiency is rarely exceeded, showing that as a heat transformer an engine has a value of only about one-fifth that of a boiler.

Considered then as a heat station, we should use electricity for temperatures from 300 degrees F. upwards, and both live steam and exhaust steam for temperatures below this limit. The best figures of operation I have found are results obtained in England, which show a horse-power hour on a consumption of 1.3 pounds of coal per hour, or a heat efficiency, reckoning from coal, of practically 14 per cent. The average of what is commonly called good practice is about 7 per cent. Obviously in station practice high prices must be obtained for energy sold, and the average figure found is $150 per electrical horse-power per year, as against the best mill practice, ranging from $18 to $35 per horse-power per year. Of course transmission losses and fixed charges on the electrical part of the equipment should be counted in.

On an average I find that the electrical horse-power hour costs four times what the mechanical horse-power hour is sold for. Large dynamo efficiencies exceed 90 per cent, showing that this excess charge must be due, conditions being equal, to a variable load line of extreme irregularities. We have as yet insufficient data from industrial and domestic applications of electricity for heating to construct a representative load line, but we know that the time of maximum cooking is at the time of least lighting, and vice versa, and that industrial applications of heating by electricity are a supplementary motor load.

We have seen that electricity generated from coal represents a heat efficiency of about 7 per cent. In practical applications, therefore, we are limited to work where high constant temperatures are a desideratum or where present efficiency of fuel is less than this figure. The most complete published tests regarding the efficiency of the common house range of which I am aware were published in Science for September 15, 1893. The author gives the results of a long series of tests. In summarizing, the total cooking efficiency is given as 2.7 per cent, and the total all-day efficiency, plus water heating efficiency, as 4.2 per cent. These figures have been closely confirmed by English observers, and 4 per cent may fairly be regarded as a good working value for average range efficiency.

We see that notwithstanding great inefficiencies in operation, electricity can be delivered at a rate of 7 per cent efficiency from central stations as against 4 per cent from coal directly burned in ranges. If we could eliminate the water boiling factor, electricity for cooking would be far cheaper than coal or gas. This difficulty in practice will have to be met by a water heater, heated directly by coal. It is this difficulty in the application of heat of simple resistance for cooking that causes me to look with confidence towards thermo-electric devices in which electricity is derived directly from heat and the diffused or scattered heat utilized in water heating for house warming, baths, and cooking. If my data is correct these devices are already made in France with an electrical efficiency exceeding 4 per cent, which, with the water heating device added, will bring total heat efficiency to practicable figures.

At the outset cooking by electricity will generally be found more expensive than cooking by coal. But the advantages attendant upon its use compensate for a wide disparity in price. I have been assured by a representative hotel man that if the cost exceeds coal cost four times, hotels will use electricity in cooking on account of cleanliness, facility of regulation, constant temperatures, cooler kitchens, and better general work.

Installations of cooking apparatus demonstrate the success of electric cooking both as regards cost and simplicity of operation. An installation in this city operating since January 1st has proven conclusively that theoretical deductions are not far-fetched, and that electric cooking can no longer be regarded an experiment or a fad. This plant consists of oven of two compartments, broiler of three sections, portable stoves of various sizes, tea-kettle and farina boiler, which have heaters directly attached to them, and plate warmer. The cooking operations are carried on beneath a hood ventilated by a fan driven by a motor, and the kitchen is very comfortable as a dining-room. At the rate of five cents per horse-power hour the cost per person per day is about two cents. At the rate of 2½ cents per horse-power hour, which may be considered a fairly representative price from water power stations, the cost per person per day would be about one cent, and from an isolated plant, directly operated, the cost per person per day would be about ⅔ cent.

Cooking by electricity will be found of greatest convenience during the summer, and it is at this time that the central station has least load for lighting, showing again how a careful study of heat conditions will increase working economy. In fact, a central station, burning large quantities of fuel, can supply a community with all its heat, both summer and winter, at a profit, and the character and size of these stations at present bear to future developments in this line about the same relations as an artesian well to a complete system of water supply.

I have read a great many able papers on the value of using exhaust steam in space heating in preference to heating feed water, but engineers are loath to undertake to supply more than one commodity from the same source. It seems incredible that with the excellent results demonstrated in practice, we see so little space heated by exhaust steam from electric light stations. By using electricity for

high temperatures and exhaust steam for diffused heats, a total heat efficiency of 35 per cent is practicable, and with light, power, and heat of varying potentials from the same source, capital invested in stations will be found more remunerative.

The use of the simple heat of resistance for room heating is not generally economical except in a case like car heating, where heat transference by electricity satisfies other requisite conditions than can be supplied by heat of fuel directly used. Heating by electrical resistance is essentially heating by friction, and no one would think of setting up a steam engine or water-wheel with a brake on the flywheel to heat a building.

On a large scale the indirect application of electricity is the only feasible way of employing electrical energy in this work. We find in practice, however, a surprisingly large number of places where a simple electric heater is of greatest convenience as auxiliary to other methods of heating. No one can foretell how far this practice will extend as the convenience of electric heaters becomes better known and the cost of electricity cheapens. Every electrical engineer knows that in practice apparatus of the highest efficiency oftentimes meets with poorer success than less efficient apparatus, because more than one requirement has to be fulfilled, and so in direct electric heaters a heater for occasional use is being found of great value notwithstanding relatively great cost of operation.

It is frequently stated that heating buildings by electricity generated by water power is practicable. For space heating coal at $5 per ton, burned under a good boiler and distributed throughout buildings by direct steam, is on a parity with the electrical horsepower at $4 per year. I know of no instances where power can be sold at this rate; in fact, interest cost on electrical plant usually equals this figure. In some places, as in southern California, where its use is for warming in distinction to heating, it has been shown feasible to use water power for room heating; and in fact in heating small offices, bath-rooms, bed-rooms, etc., direct electric heaters are coming into considerable use. We may term them all, however, special cases, but may fairly state that in communities of like character the extent of use will be directly proportional to relative costs of electricity.

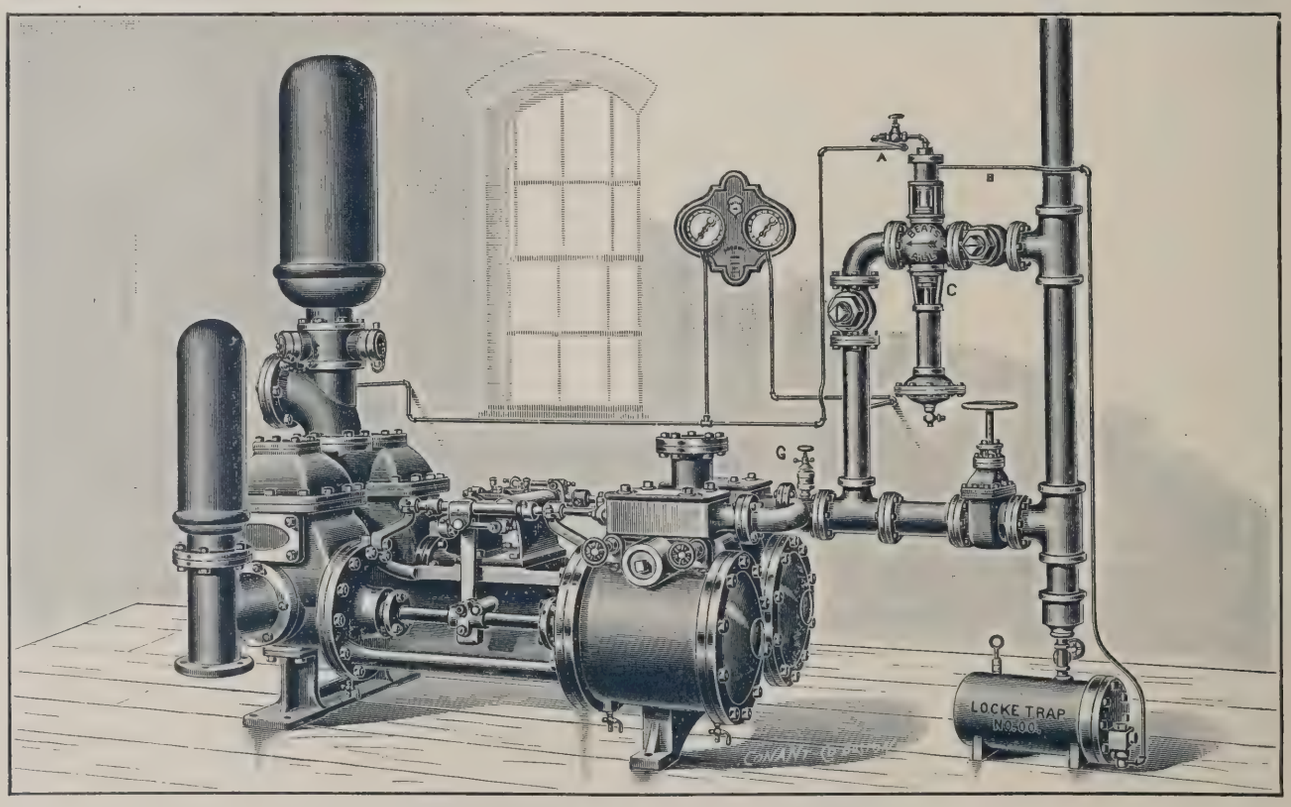
In the operation of isolated plants in mills, hotels, etc., electric heating will open up a multiplicity of applications, so that we may expect elimination of flame for heating as well as lighting. In hotel work we have probably the opportunities for most economical utilization of fuel as well as materially improving existing conditions. Using electricity for boilers, fat fries, griddles, and ovens, live steam for kettles and pots, and exhaust steam for heating steam tables, coffee urns, etc., and the surplus for room heating in winter and feed water in summer, we approach complete practice.

By immersion heaters we may heat all sorts of fluids and bodies that liquefy at temperatures not exceeding 500 degrees F. There is found to be absolute safety, easy heat variation, proper diffusion for uniformity of temperature, and economy in this practice. In fact, the industrial applications of electricity as a fuel appear almost unlimited, and even at the high cost per heat unit commonly charged, electrically heated apparatus is rapidly coming into use.

In the foregoing I have shown the limitations and possibilities of useful work from heat transference by electricity. We have seen that the field of use is an actual one on questions of efficiency, equable distribution, and convenience. The value of high potential heat energy to central station men has been pointed out.

The Locke Pump Governor.

Some time ago we illustrated and described in these columns a pump governor manufactured by the Locke Regulator Company, corner North and Franklin streets, Salem, Mass. The illustration on this page shows the manner of connecting the governor to a pump. The governor is shown at *C*, in a branch connection on the steam pipe, so arranged with valves that it may be cut out if necessary. The governor is acted upon by the pressure in the pump discharge, which is connected with the governor by the pipe *A*, which also connects with a pressure gauge on the wall as shown in the cut. When the pressure in the discharge reaches any desired point for which the governor is set the governor shuts off the steam supply, thereby stopping the pump until the pressure falls, when the governor again admits steam to the pump. The governor is entirely automatic in its action.



CONNECTIONS OF LOCKE PUMP GOVERNOR.

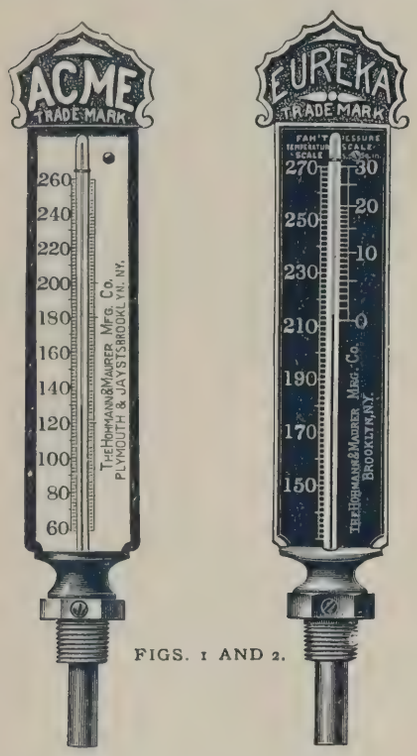
Fire bricks have recently been molded of kieselguhr, which is nearly pure silica. They are very light, and are nearly as infusible as quartz, besides being very porous.

The amount of mineral matter held in solution by water ordinarily supplied for boiler purposes varies from 10 to 150 grains per gallon. In some extreme cases water having as high as 200 grains per gallon has been used.

NEW SPECIALTIES.

H. & M. THERMOMETERS AND THERMO-STEAM GAUGES.

Fig. 1 represents the Acme straight hot water thermometer with black dial and interchangeable separable feature. The frame of the thermometer is made



FIGS. 1 AND 2.

of cast iron, heavily coated with copper and finished in brass, bronze, or nickel plate. The dial is stamped, and as shown by Fig. 3, which is a full size cut, the figures, graduations, and mercury column are plain and distinct so as to be readily seen. One of the valuable features of this theremometer is the detachable socket shown in Fig. 4, the object of which is to obviate

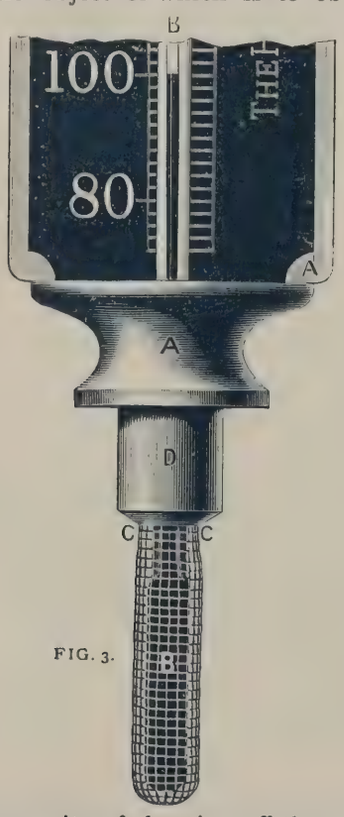


FIG. 3.

the necessity of drawing off the water in case the thermometer should be broken. All that is necessary is to loosen the set-screw *D*, take out the thermometer top, and replace it with another. This separable feature allows the face of the thermometer to be turned in any direction without affecting the stability of the instrument, and the mercury cannot leak. The tube or stem of the socket is covered with a heavy copper plating to prevent rusting, and is of the smallest possible diameter to insure sensitiveness, mercury being used as the conducting medium. The bulb is surrounded by a wire basket, as shown, so that the particles of broken glass may be drawn out should the tube ever break. This is essential, as the separable feature would be rendered of no value if the broken particles fell into the socket, from which it would be difficult to remove them without unscrewing it. Fig. 2 shows the Eureka thermo-steam guage for low pressure steam heating. As shown, it consists of a thermometer graduated to indicate temperature on one side and pressure on the other. The general construction of this instrument is exactly the same as that of the hot water thermometer, being separable, with mercury bath and black dial. Fig. 5 shows the Standard thermo-steam gauge for use in large steam heating plants. It is finished in polished solid bronze metal, with the scales or dials hermetically sealed under a removable glass plate. The Hohman & Maurer Mfg. Co., Plymouth and Jay streets, Brooklyn, N. Y., are the manufacturers.

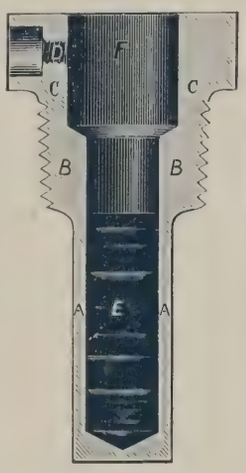


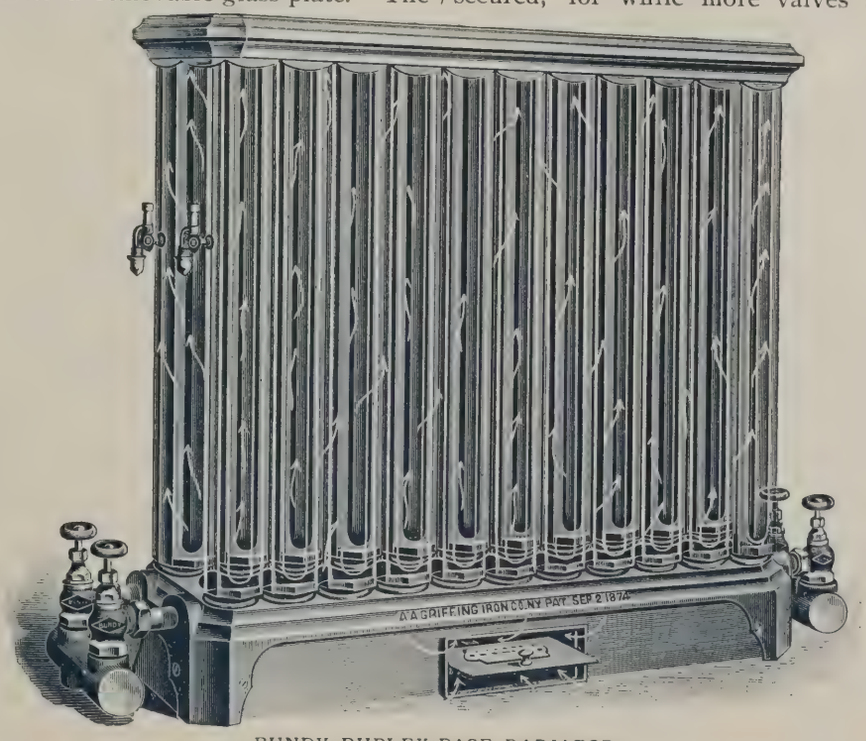
FIG. 4.

BUNDY DUPLEX-BASE RADIATOR.

The accompanying cut illustrates the Bundy duplex radiator with duplex crescent dampers complete, made by the A. A. Griffing Iron Co., New York. The arrow heads show the air circulation. A damper like the one shown in the front panel of the direct-indirect skirt is also placed in the rear panel. These two dampers are connected with a rod in such a manner that when one is open the other one is closed. They may both be partially open or closed. For ease of operation an ornamental nickel-plated knob is affixed to the front damper as shown in the cut. Another feature of this radiator is its duplex base, which enables the user to turn on one or both rows of loops at a time, making available three different sizes of radiators. In other words, there are heating elements of three different powers in each radiator used, for the heat from the rear row of loops is less than the front row, it being masked by the front row, which moderates the heat, while the heat from the front row of loops is stronger, as it enters the room direct and unimpeded. The extra cost over the ordinary construction is slight, the manufacturer informs us, wholly disproportionate to the great advantage secured, for while more valves are used they may be of smaller size, and by using the header the extra cost of fitting up is very slight.



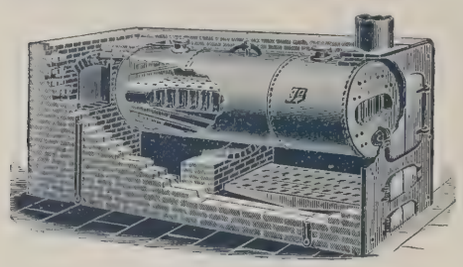
FIG. 5.



BUNDY DUPLEX-BASE RADIATOR.

RANTON STEAM BOILER.

Our readers will notice in this boiler a sort of family resemblance to the Galloway boiler, which is much used in England. The peculiar feature of its construction is the arrangement of water tubes in the large flattened oval fire flue, which extends through the boiler from front to rear. The course of the products of combustion, as will readily be understood from the engraving, is from the furnace underneath the boiler to the rear, and back through the flue to the front. As all parts of the interior of the boiler are readily accessible, it is easily cleaned, and the water tubes, it will be seen,

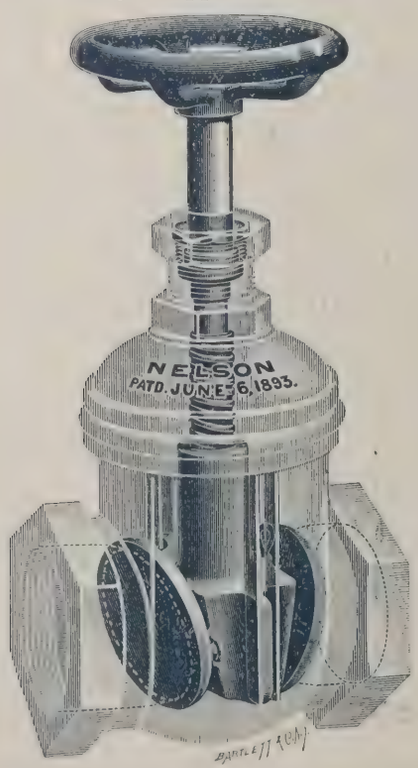


RANTON BOILER.

may be easily removed or renewed. Combining as it does some of the good features of both tubular and water tube boilers, it should give very economical results. This conclusion is borne out by strong testimonials from those who have had it in use sufficiently long to give it a thorough test. It is built by the Ranton Boiler Co., of Syracuse, N. Y., for whom the Pierce & Miller Engineering Co., of 42 Cortlandt street, New York, are the general agents.

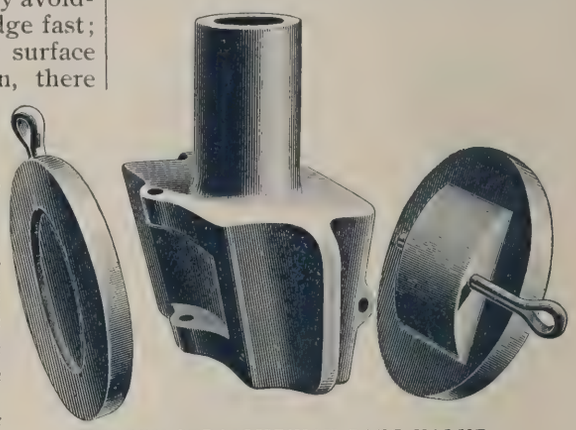
NELSON'S STRAIGHTWAY GATE VALVE.

The construction of this valve is clearly shown in the engravings. As may be seen, it is double faced, the pressure may be applied to either side,



NELSON STRAIGHTWAY GATE VALVE.

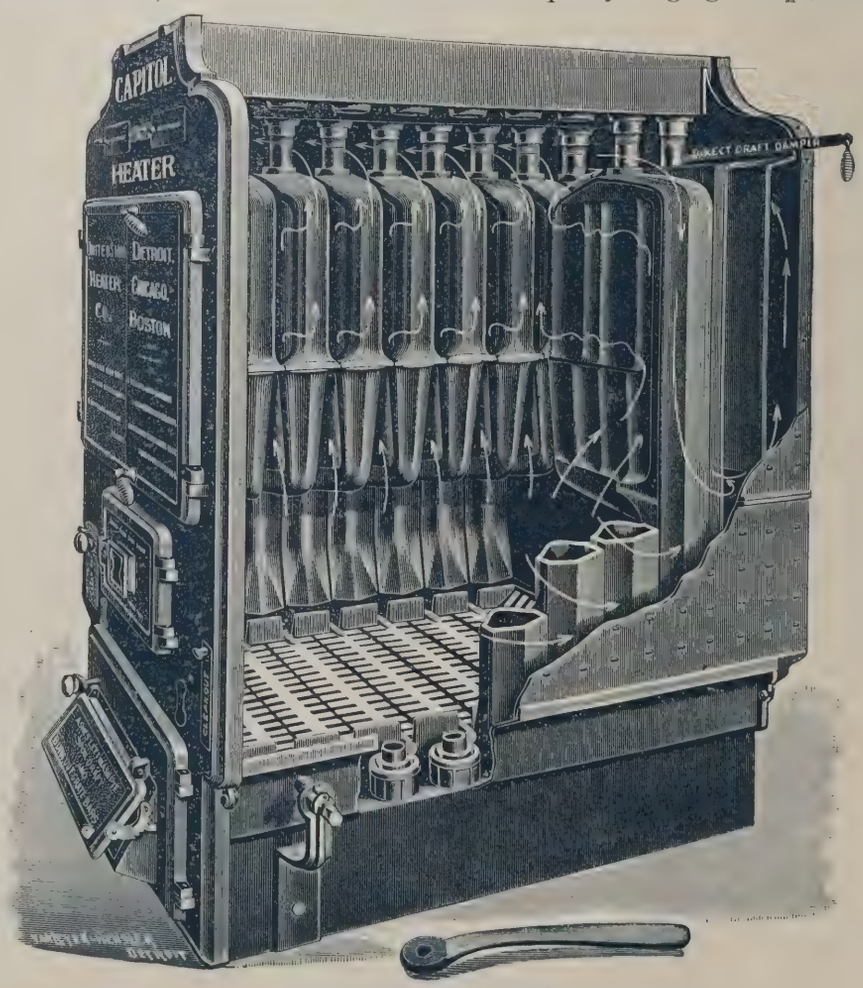
and it may be easily opened or closed when under pressure. The compensating disks are pivotally hung upon the central wedge in planes at right angles to each other, forming a sort of universal joint, insuring perfect seating under all circumstances. The construction is such that in opening the valve the wedge is slightly drawn from between the disk, thereby avoiding all tendency to stick or wedge fast; and as there is ample bearing surface at the back, curved as shown, there is nothing to spring or bend. The cotters or pins are merely to hold the disks in position. Up to 2½ inch valves the disks are made of copper, larger ones having cast iron disks with inserted copper rings. A tongue on the gate fitting into a groove in the valve body, as shown in the transparent cut, prevents the stem from being bent by unequal pressure. The angle of the valve faces is such that by a slight turn of the spindle the disks are cleared from the seats. Angle valves, sliding stem and lever valves, and other kinds, are made on this principle in all sizes; and the manufacturers (Pacific Tucking & Mfg. Co., 471 Eighteenth street, Brooklyn, N. Y.) state that all valves are tested to 500 pounds pressure.



NELSON STRAIGHTWAY GATE VALVE.

NO. 400 CAPITOL HOT WATER HEATER.

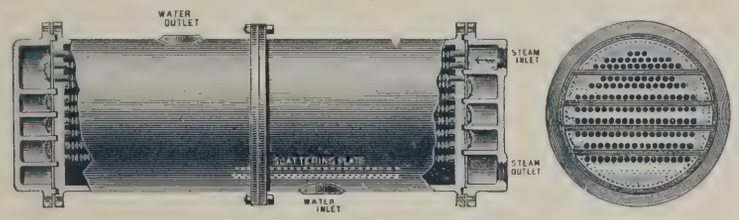
We present herewith an illustration of a No. 400 Capitol hot water heater. This is adapted to larger work than the former sizes, and its construction shows some modifications. The intermediate sections are 5 inches wide, instead of 4, the width of the original Capitol section. The sections do not meet at the top of the fire pot, but an opening is left which permits the radiant heat to strike against the heating surfaces as far up as the middle waterway, making those surfaces practically self-cleaning. The front is not a water section but a plate casting, heavily lined where the fire strikes. The section of this front just below the fire door can if desired be replaced with a small water front like the water front of a kitchen range. This is useful for supplying water for domestic purposes. It has a cast-iron casing which forms a return flue when the direct draft damper is closed. The casing is coated with asbestos to prevent loss of heat, but brickwork can be substituted. It is made in six sizes with a capacity ranging from 1,600 to 4,400 square feet of radiation. It is made by the United States Heater Company, Detroit, Mich.



No. 400 CAPITOL HEATER.

McLAUGHLIN FEED WATER HEATER,

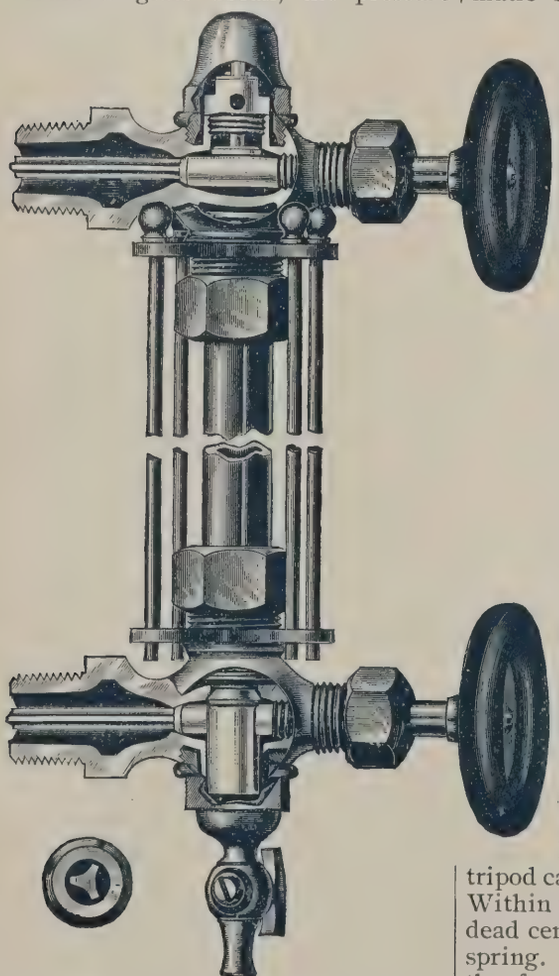
Shown in the accompanying engraving, is manufactured by the Taunton Locomotive Mfg. Co., of Taunton, Mass. It it designed to use waste hot water and the water of condensation as a heating agent, with special reference to the needs of such establishments as paper mills, etc. The waste water passes through the tubes, and the feed water is pumped in at the bottom of the heater and taken out at the top, being delivered to the boiler at a temperature very near the boiling point.



McLAUGHLIN SPECIAL HEATER.

AUTOMATIC SELF-CLEANING WATER GAUGE.

The Michigan Lubricator Co., of Detroit, Mich., are the manufacturers of the automatic self-cleaning water gauge illustrated herewith, G. B. Essex being the inventor. The sectioned part shows its construction. Its principle is, that, in ordinary use the pressure on the top and lower arms being equal, the automatic checks do not operate, and the gauge performs the functions of an ordinary one, but should a glass break, the pressure being on the under side only of the automatic checks, forces them to their seats, which prevents steam from escaping. After the engineer has seated the valve stems in both arms, and the pressure is withdrawn, the checks drop from their seats of their own weight. After a new glass has been put in place and the valve stems withdrawn, the pressure on the top and bottom of the checks is again equalized, and they remain away from their seats. From the above it will be understood that the gauge is automatic in action. The detailed cut shows that the valves can be gotten at for cleaning without detaching the gauge and while the boiler is under pressure.



AUTOMATIC SELF-CLEANING GAUGE.

STANDARD VALVE RESEATING MACHINE.

In this appliance the rotating and feed mechanism may be detached from their standard and inserted into a taper bushing, as shown in Fig. 1, for regrinding and burnishing the seat. By this means one simple machine is made to repair both the valve and seat, and to perform the latter operation without disturbing the piping and with the valve in situ. The frame is made extensible to the greatest degree with a given amount of material by making both standards adjustable, and extending their range considerably beyond the length of the bed by allowing both, if necessary, to project over the guides. The machine as arranged for grinding a valve disk is shown in Fig. 2. A hollow stem secured by the set screw in the left-hand guide ends in a tripod carrying a stationary face plate. Within this hollow stem is a yielding dead center held outward by a spiral spring. Radial slots and grooves in the face plate secure the cutter and supporting blanks, beveled alike at both ends, the cutter being toothed like a milling tool, the blanks simply serving to support the disk while being cut and burnished. The yielding dead center serves to center the valve while the blanks and cutter are being adjusted about it, and recedes before the valve as it is pushed up to the cutter by the feed screw. The live center end of the machine consists of a hollow feed screw, rotated by the hand wheel shown, through which extends the live spindle rotated by the crank and carrying the dog which locks it to the valve. The crank is revolved with one hand while the valve is fed up to the cutter with the other, and when all grooves and irregularities have been removed the feed screw is locked by the nut at the left of the hand wheel and the crank rotated until the surface is thoroughly burnished.

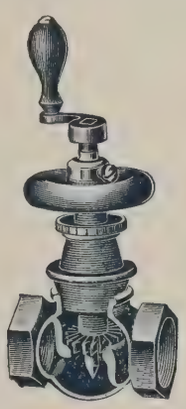
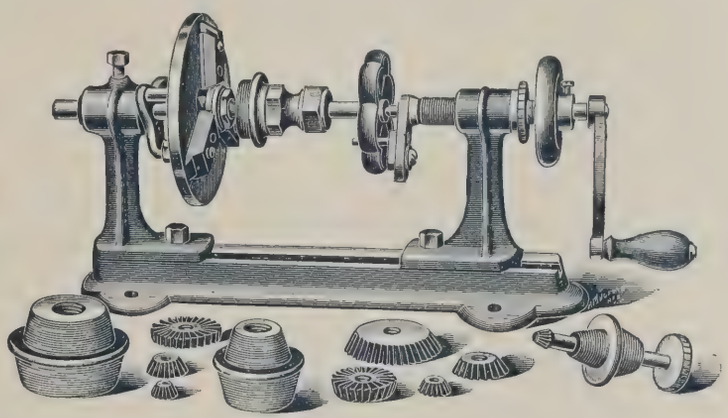


FIG. 1.

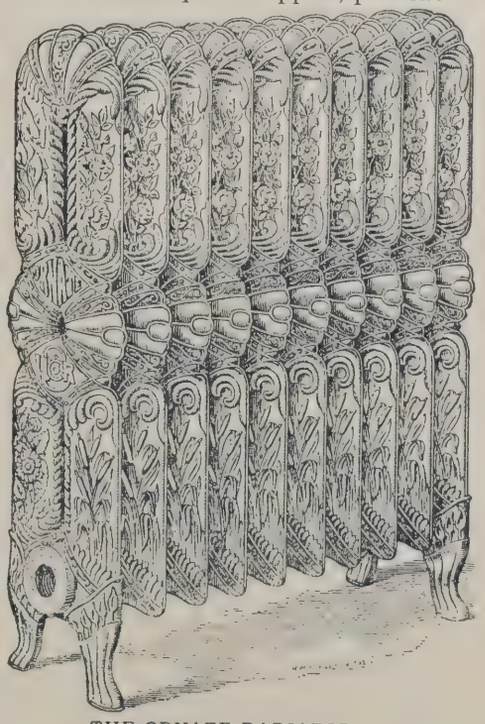


STANDARD VALVE RESEATING MACHINE. FIG. 2.

F. S. Dangerfield, Auburn, N. Y., is the manufacturer.

THE ORNATE RADIATOR.

As will be seen by the engraving, the manufacturers of this radiator (the United States Radiator Co., Saltsburg, Pa.) have broken away from the conventional upright, straight outline in its design, producing a novel and ornamental effect, though the circulation remains the same. They are put together with perfectly true push nipples, preventing the possibilities of leakage. The J. L. Mott Iron Works, 84-90 Beekman street, are the New York agents.



THE ORNATE RADIATOR.

Heating and Ventilation

Published Monthly by

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ATTENTION is hereby directed to the notice of a preliminary meeting for the formation of asociety of heating and ventilating engineers, which is given on page 19 of this issue. This movement is one of great importance, and should have the hearty support of every engineer who has the welfare of his profession at heart and earnestly seeks to secure its advancement, the objects of the new organization being such as would give to the work of heating and ventilating engineers a prominence and dignity heretofore unknown. It is not intended that the new society will in any way antagonize the Master Steam and Hot Water Fitters' Association, of which the majority of heating and ventilating engineers throughout the country are not members, because the business men of which the Master Steam Fitters' Association is largely composed do not appreciate an engineer's feelings in regard to technical matters, giving much less attention to the technical than to the business side of the art by means of which they gain their livelihood.

EXCEPT in a few cases master steam fitters will not be eligible for membership in the new organization, the idea being to build up a society composed of designers and engineers whose work and qualifications are up to a certain standard of excellence, so that membership in the society would be of actual value both to the member and to the society. What shall constitute the necessary qualifications, cost of membership, etc., will be determined at the next meeting, when the widespread belief in the benefits to be derived from the successful formation of the proposed society will be shown, no doubt, by a very large attendance.

WE have several criticisms of the article by Albert Spies, M. E., in our March issue, which assume it to be directed against exhaust heaters and exhaust heating in general. The article should be taken for what it is, a record of a particularly wasteful use of exhaust steam where only a very small percentage of the steam discharged could be used, and this at the expense of an enormous back pressure. It was cheaper to use live steam for the heater and let the exhaust go. It would have been cheaper still to use a heater which would not obstruct the exhaust unduly, and to have continued the use of the spent steam.

KNOWLEDGE, an English contemporary, tells of a thermometer for high temperatures recently invented by Messrs. Baly and Chorley. The mercury of the ordinary thermometer is replaced by an alloy of sodium and potassium, which is liquid at ordinary temperatures and remains so through a long range. When a very hard glass is employed it becomes possible to measure temperatures up to 1150 degrees F. Why is this not the thing for measuring uptake temperatures, a knowledge of which is as important to the efficient running of a plant as is that of the steam pressure to its safe and practical operation?

PERIODICALLY there floats through the technical press an item to the effect that one-sixteenth of an inch of scale has been determined by accurate experiment to require fifteen per cent more fuel; three-sixteenths, twenty-three per cent, et . While this may be strictly true for the boiler experimented upon, it cannot, in the nature of things, be of universal application, nor an index of the loss which may be expected upon another boiler from a given thickness of scale. A boiler with a meager amount of heating surface would suffer seriously from an impairment of the efficiency of that surface by scale, while a boiler with ample surface would suffer comparatively little. The item evidently started from a formula based by Nystrom upon the alleged fact that saturated scale has about one-thirtieth the conductivity of iron plate, and giving the diminishing values quoted as the amounts of heat transmitted through a given amount of heating surface.

LACK of attention to ventilation and to the prevention of excessive radiation results in a temperature in some engine and boiler rooms which is simply unbearable. The extreme heat of the past month has been sufficiently trying even to those who could avail themselves of such air as there has been; and certainly the man who is obliged to pass his time in constricted quarters in close proximity to a hot boiler front or a cylinder under steam should be allowed any amelioration that can be secured. As much attention should be paid to the protection of indoor pipes by non-conducting covering in hot as in cold weather. It is a fact not always recognized that a pipe will condense as much steam in the summer time, with windows and doors open and a free circulation of air, as it will in the coldest of weather with the air about it already heated, but without a chance to escape.

THE heated air may be removed from the top of boiler rooms by running up a trunk from the ash-pit and drawing the supply for the furnace from the heated upper layers, admitting fresh air at a point remote from the boiler and near the floor. The heated air is good for the furnace, and a material reduction of the fire room temperature is possible by this means. With good ventilation and a liberal use of non-conducting covering a great deal can be done toward making engine rooms habitable, and the investment will as a general thing be warranted by saving from radiation and applying to a useful purpose the heat whose escape contributes so much to the discomfort of those who are obliged to live among the machinery.

LETTERS FROM PRACTICAL MEN.

Correspondence from practical men upon topics of interest relating to Heating, Ventilating, and kindred subjects, will find a place in this department. The editors, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

Tube or Flue.

The Furman boiler is described by Mr. A. C. Walworth, of Boston, in the June number of HEATING AND VENTILATION as a drop flue boiler, and in justice to the manufacturers this statement should be corrected, as the Furman boiler is exactly the contrary in construction, being a drop tube boiler. It must be assumed that it was a slip on the part of so able a man as Mr. Walworth to have described the boiler any differently. A vertical "drop tube" is practically self-cleaning, while the vertical "drop flue" requires constant attention with the flue brush; and for relative value, it seems to me there is no comparison in boilers of this type. J. G. Dudley.

Report of a Boiler Test.

I notice in the last issue of HEATING AND VENTILATION the report of a boiler test conducted by the Model Heating Company on one of their new boilers, wherein they state they have evaporated nearly 14 pounds of water from 62 degrees F. to a pound of fuel, and that you state that the results were sufficiently interesting to warrant further inquiry.

As a matter of fact, the Model Heating Company are deceived. The figures of the test are correct, but they do not state all the conditions which enter into a properly conducted experiment. In the first place, if we assume that they evaporated only 13 pounds of water per pound of fuel, it would be impossible, even under the most perfect conditions. The facts in the case are these: To raise 13 pounds of water from 62 degrees to a temperature of 212 degrees requires an expenditure of 1,950 units of heat, being one unit to each pound raised one degree; to evaporate one pound of water at 212 degrees requires an expenditure of 966 units. Therefore to raise 13 pounds of water from 62 degrees F. to 212, and evaporate it, we must have used a total of 14,508 units of heat. One pound of pure carbon, to say nothing of coal, perfectly consumed, yields us 14,500 units, from which we may conclude that the evaporation of 13 pounds of water from 62 degrees F. to one pound of fuel is a physical impossibility, when we consider besides that some heat must be utilized in the draft and some heat absorbed by the boiler. The figures which are given in the test are undeniably correct; that is, the company have without question disposed of 13 91-97 pounds of water per pound of fuel consumed, but they have not evaporated that number of pounds of water to a pound of fuel.

In all correctly conducted boiler tests it is essential that a calorimeter be used, and this instrument plays a very important part in modifying the results obtained. If the Model Heating Company were to reconduct their test, using a calorimeter, and gauge their results accordingly, they would find (as they undoubtedly have a very good type of boiler); that they were evaporating possibly 6 or 7 pounds of water to a pound of fuel, and the remaining weight of water which made up their results in the original test was passing out of the boiler with the steam in the shape of a finely divided spray or mist. There are very few boilers, in fact none, which, tested under the conditions which this boiler was tested under, will give a perfectly dry steam, and it is very important that the amount of water carried over in steam be accurately and carefully determined. There are many boilers which would, under the given conditions, show a high apparent evaporation in consequence of furnishing wet steam. There is probably no type of boiler which makes a perfectly dry steam, although steam which does not contain more than 3 per cent of moisture is ordinarily considered to be dry steam. We think if the Model Heating Company were to conduct another test, bearing this point in mind, they would secure a result which would be materially different from the one published, and yet it might be fully as much to their credit and the credit of their boiler.

Knight.

A Ventilating Problem.

As a possible solution of the ventilating problem presented by "Contract Open" in the May issue, I would suggest the placing of two ventilating flues at the points where the heat is generated, that is, as near as possible to the boilers, discharging the heated air at the sidewalk. By providing a small steam jet a powerful draft could be created in the flues and the hot air readily drawn from the cellar. As arranged at present the ventilating

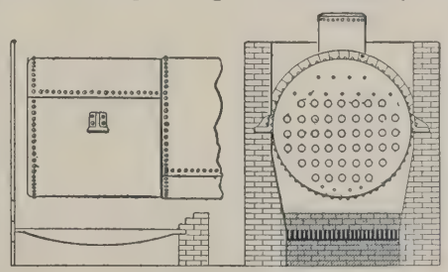


A VENTILATING PROBLEM.

flue *F* has a tendency to draw hot air to it, which explains the high temperature at the party wall. By providing the two suggested ventilating flues, one between the boilers *A*, *B*, and *C*, and one over or near *D*, this trouble would be avoided, and the air would flow out readily without heating the cellar. A. W.

Boiler Setting.

I should like to get the opinion of your readers as to the boiler setting shown in the inclosed sketch. It is a new plant, consisting of three boilers, each 84 inches in diameter by 16 feet long, with 25 square feet of grate surface. The bridge wall, 12 inches high, is built of fire brick set with common mortar, as is all the rest of the brickwork. There is no filling back of the bridge wall. There is a 14-inch smoke space back of the boilers. Six tons of coal are consumed in 24 hours under two of the boilers. One boiler carries only ten pounds pressure, for steam heating through an 8-inch main; the



BOILER SETTING.

other carries 80 pounds, supplying steam to two engines, one 10 by 16 inches, and one 10 by 8, high speed. It is supposed to be a first-class plant. What think you?

N. O. Expert.

The Value of Good Valves.

Strict economy is the aim of all well managed manufacturing plants, yet there is one thing apparently lost sight of, the small things which singly amount to little or nothing, but combined reach a daily loss which would greatly surprise those who think they are model economists. There is, perhaps, no other more important factor in daily loss than leaks around water and steam pipes, valves, etc. You struggle to get cheap fuel to make steam and furnish power to pump water, and perhaps make exhaustive tests on evaporative power of boilers by costly appliances to save fuel, etc., yet you have about your plant numerous leaky valves with no means of repairing them except at great expense, equal to the entire first cost of the valve or more.

From experience, the writer states that no valve has ever been made which will not wear out and leak from cause. The expense of repairs is figured, and the cost is so great that they use them as long as possible, incurring loss each day. Gate valves are being used more and more every year for steam and water. Take a two-inch valve, or a six-inch, or three-inch; if this valve was leaking, you would hesitate a long time before removing it from the pipes to be repaired, yet it is impossible to do so, in most cases, without first shutting down your plant. There are not only small gate valves made, but some as large as 20 inches or 22 inches, which can be repaired on the pipes without loss of time and at a very small expense, and we find it a great source of satisfaction, as well as economy, to use them, although first cost is perhaps a trifle more. G. M.

Temperature Regulation.

In the June issue appears an article signed "Warren S. Johnson," in which the writer claims to show the impossibility of automatically maintaining a uniform temperature in ventilating systems with a thermostat operating the dampers gradually. His theory is correct, but in the applications of it he falls into a serious error, in requiring 10 degrees of change of temperature to fully move the damper. If he were familiar with gradual operating thermostats he would know that 3 degrees change is ample to fully open or close a properly constructed damper. Suppose with this change we appply his theory. Damper commences closing at 69 degrees, and is fully closed at 72 degrees. Outside temperature, zero. All sections of heating coil turned on, result, a constant temperature of 70 degrees—damper one-third closed in hot air flue, incoming air 100 degrees.

Suppose outside temperature raises to 30 degrees; hot air damper assumes a position two-thirds closed, cold air correspondingly open; temperature constant at 71 degrees, incoming air, 85 degrees.

Suppose temperature outside raises to 60 degrees; hot air damper nearly closed, cold almost open; temperature 71½ degrees constant; incoming air 75 degrees. Thus under different conditions there would be a variation of 1½, or, perhaps, 2 degrees, the variation only occurring as the weather changes.

Now let us add another element to the combination. Suppose when the outside temperature raised to 30 degrees the engineer should close off a proportionate part of the radiation, as is customary with all systems of regulation, whether automatic or otherwise. Result, hot air damper one-third closed, temperature 70 degrees.

With a higher outside temperature more sections are cut off. Position of dampers and temperature remain substantially the same, the temperature of the incoming air being lower. Thus we see that without any attention there would be a temperature varying about 2 degrees, which variation can be corrected if desired, either by attention to the radiation or by changing the adjustment of the regulators 1 or 2 degrees. The temperature for the time being is constant, and a variation of 2 degrees occurring at intervals in accordance with weather changes is not noticeable.

Now, on the other hand, while Mr. Johnson does not say so, he makes it very easy for the reader to infer that with a thermostat operating the dampers instantaneously, uniformity of temperature would result. That this is a fallacy is evident, as the thermostat depends for its action upon constant changes in the temperature. When the hot air flue is closed, we will

suppose that tempered air at 65 degrees is being thrown into the room. This results in an immediate fall of temperature until the thermostat, responding, turns on the power that is used to operate the dampers. Then the cold air is shut off, the hot turned on, and the result is a change of the incoming air from 65 degrees to 100 degrees, or less, according to the number of sections in use in the heating coil controlled by the engineer. The temperature of the room rises until the thermostat makes a contact on the other side, when the operation is repeated, and so on.

While it is true that an electric thermostat can be so delicately adjusted, under the care of an expert, as to require but a fraction of a degree to operate it, it is well known that in the hands of the public they cannot be depended upon to work continuously on a narrower margin than about 2 degrees. So here we have a system requiring in its very nature a change of 2 degrees to make it operate, and with it we are supposed to maintain a uniform temperature—a manifest impossibility

It is not claimed that these variations of 2 degrees are in either case objectionable. A temperature maintained within two or three degrees is substantially uniform, and when the intervals between changes are wide, cannot be detected except with a thermometer.

The points we wish to make are these: First, with a gradually closing damper there is a constancy of action that does not exist with the other system, which is always changing. Second, with gradual closing the engineer can, with very little attention occasionally bestowed, cause a strictly uniform temperature to be maintained. This cannot be done with the "open and shut" system, as continual fluctuations of temperature are essential to its operation.

Finally, leaving the two systems to themselves, so that they will be strictly automatic, which is the better to have, a constant temperature for the time, with a possible variation of 2 degrees under varying conditions, or to have a constant variation of 2 degrees, the changes following one another at intervals of a few moments?

We have in one case a steady stream of properly heated air pouring continuously into the room, the mixture taking place in the flue; while in the other, successive currents of hot and cold air, following each other at short intervals, which, mixing in the room, keep the fluctuating temperature within certain limits. Again, with the alternating system, a separate tempering coil must be used that the cold air be kept from being too cold. This requires an additional thermostat, which, with the tempering coil, adds materially to the expense. Neither of these is required with the gradual working damper.

W. P. Powers.

Size of a Boiler.

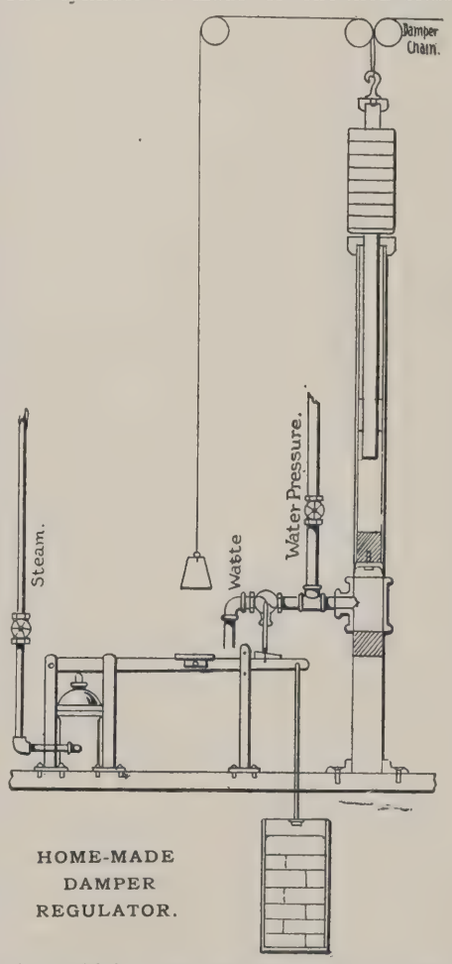
I note in your May issue an inquiry with regard to the size of boiler necessary for maintaining the temperature in a tank of water from which a certain amount of water is drawn every hour, and its place supplied with cooler water. This question has also presented itself to me, and I enclose an explanation of my own method of ascertaining these sizes.

So far as the question in hand is concerned, the problem is simply to determine what size boiler or heater is required to raise fifty gallons of water from 60 to 200 degrees F. in an hour. In considering the question this way we, of course, are making the assumption that there is nothing particularly different from the average in the manner in which this water is to be warmed, and that there are no features in the way of circulation or piping, etc., which could be considered as materially affecting the result. The method as I shall outline it will be simply a consideration of the size of boiler which is necessary to absorb the amount of heat represented by the works of raising fifty gallons of water 140 degrees. Fifty gallons of water represent the weight of 417 pounds. As one unit of heat raises one pound of water one degree, to raise 417 pounds 140 degrees, or from 60 to 200 degrees, requires 58,380. The size of boiler to do this work is most conveniently determined on a basis of fire surface. A foot of fire surface, working under these conditions, will absorb about 2,500 units of heat per hour. This is good fire surface, and must be actual fire surface.

The question now stands, How many feet of fire surface must we have to absorb the required 58,380 units of heat? The solution of this problem in division gives us 23½ square feet of fire surface, which is the essential requirement of a boiler to do the work specified. The results arrived at by the above method will give a good, practical average, and these results can afterwards be strengthened by the introduction of such factors of safety as the judgment of the engineer may dictate. A. B. C.

Home-Made Damper Regulator.

Here is a rough sketch of a damper regulator I have made and have had in use during the past six months. Any engineer can make it if he has an old diaphragm damper, and if he has not, he can buy one for the price of old iron. It will hold steam within a variation of one pound. The cylinder is made of one-inch brass



HOME-MADE DAMPER REGULATOR.

pipe, which comes very smooth and even. It has a cap on the top, with a hole in it slightly larger than the piston rod. On the bottom is screwed a tee, reduced to a quarter of an inch. Into the bottom of the tee is screwed another piece of one-inch pipe, the upper end of which is plugged with solder, a flange being screwed on to the bottom for fastening it to the table with.

The piston is a piece of ¾-inch brass pipe (which makes a very close fit), the lower end being plugged with solder, to which is secured a leather washer, making a cup-shaped packing. The piston rod is ½-inch pipe (which is a close fit in the ¾-inch piston) secured in place by a pin. In the upper part of the rod is another pin for the weights to rest on, and at the end is a hook to fasten the damper chain to.

The regulating valve is a ¼-inch globe with the threads reamed out, the threads on the stem being filled with solder and smoothed off with a file and fine sand paper till there is a good sliding fit. The stem is packed loosely. The valve is put on as shown in the sketch, so that the pressure tends to open it when the cylinder is full. A hole is bored in the end of the stem and it is wired to the diaphragm lever, using a wedge between the lever and stem so as to have no lost motion. There is a bracket on each side of the lever, with a pin above and below, so that the lever will not rise or fall more than 3-64ths of an inch. From the end of the lever is suspended a box filled with bricks so that the steam pressure may be varied by removing or adding more weight. A light chain attached to the piston rod hook, as shown, has a small weight at the end, so adjusted that it will rest on the lever when the damper is half closed. The water pressure is connected with valve as shown (mine is from the town water system, 80 pounds pressure), the waste pipe running to a tank or to the sewer.

The operation is as follows: The water valve being opened very slightly, water flows through the regulating valve to the waste pipe. When the steam rises, the lever closes the regulating valve, and the water forces up the piston half way, or until the half-way attachment weight rests on the lever, holding the damper half open. Another slight increase of pressure sends the piston all the way up, closing the damper tightly, and vice versa. Closer regulation is secured by not using the half-open attachment, but I think it is better to use it if soft coal is burned. My damper stays half open three-quarters of the time until we start up the electric light engine, then it is wide open most of the time, occasionally shutting half way and then opening wide again.

I don't know whether this damper infringes any patent, but I think not.

Y. Valve.

Wasteful Use of Exhaust Steam.

In your March number you produce, under the above caption, an article by Mr. Spies. His views are in harmony with my experiments, so that I venture to send you the principal results of accurately conducted tests of a plant near Syracuse, which I made last September.

The engine was of the non compound, non-condensing, high speed type, nominally rated at 200 horse-power; cylinder, 18½ by 18 inches. Steam was supplied by three tubular boilers, 66 inches by 15 feet, with 109 three-inch tubes; the stacks were 70 feet high; coal was 50 per cent lump, run-of-mine, bituminous.

Indicator cards were taken every five minutes. Moisture in steam, temperature of feed water and stack, and all usual data, were carefully ascertained. The results are compared as follows:

Items.	Test with 11.2 lbs. back-pressure.	Test with 2.2 lbs. back-pressure.
Duration of test, hrs	11	10
Steam in boilers, gauge	90	80
Chimney draft, ins	⅛	⅛
Barometer, ins	29.58	29.46
Feed water, °F	69	67
Total coal burned, lbs	13,200	9,000
Per cent moisture in coal	4	3
Total dry coal burned, lbs	12.672	8,730
Ash and refuse, lbs	844	600
" " " per cent	6.7	6.9
Dry combustible burned, lbs	11,828	8,130
Mean back-pressure in cylinder at mid-stroke, lbs	11.2	2.2
Average mean effective pressure on piston, lbs.	40.7	39.3
Average revolutions per min.	183.5	185.7
Average indicated horse-power	180.6	176.5
Pounds of dry coal used per hr. per indicated H. P.	6.38	4.95
Increase in coal consumption by increasing the back pressure 9 pounds, per cent	29.	

This general result I also found by tests made on a similar engine 10½ by 10½ inches cylinder, supplied with steam from one of the above boilers. The engine drove a dynamo to operate 300 sixteen-candle power lights. During each test the work done was the same, while 23.8 per cent more coal was used when the back pressure was 10 pounds than with a free exhaust.

Jay M. Whitham.

NEWS AND NOTES.

LARGE BUILDINGS.

Utica, N. Y.—The plans for the remodelling of the Butterfield House have been completed by Architect Constable, and provide for the complete modernizing of that hostelry.

Philadelphia, Pa.—Plans for the proposed four-story flour warehouse of the Merchants' Warehousing Company, to be erected at Beach and Shackamaxon streets, at an estimated cost of $100,000 have been submitted to the Building Inspectors. The new building of the Real Estate Title, Insurance & Trust Co., to be erected by Doyle & Doak at Nos. 523-525 Chestnut street, opposite Independence Hall, will cost about $97,000. It is to be three stories high, of stone and iron, and has a frontage of 47 and a depth of 120 feet.

Binghamton, N. Y.—The Lackawanna will build a new passenger station.

New York, N. Y.—Louis F. Heinecke, architect, has drawn plans for a six-story brick factory, 50 by 90, at Nos. 515 and 517 East 137th street, to cost $26,000. John Klein, owner. Leoanor Haughen, architect, has drawn plans for a one-story brick theatre building, 67 by 102, at Nos. 147 and 149 East 8th street, to cost $14,000. Cornelia M. Stewart, owner. The New York Tool Warehouse Co., James MacNaughton, president, have filed plans for a brick wool warehouse, exchange, bank and club, on the block bounded by St. John's Lane and West Broadway, costing $275,000. The trustee of the estate of G. Bruce Brown has filed plans for a four-story brick store building at Nos. 743 and 745 Broadway, running through to Mercer street, 125 feet south of Clinton Place, costing $30,000.

Boston, Mass.—Architect J. P. Putnam has drawn plans for the new apartment hotel which W. H. H. Newman is to erect at No. 29 Commonwealth avenue, corner Berkeley street, to be nine stories high.

Philadelphia, Pa.—Doyle & Doak, contractors, will erect a three-story brick, stone and iron bank at Nos. 523-525 Chestnut steet.

Washington, D. C.—Wm. C. Morrison will rebuild the Eckington Hotel property, recently damaged by fire, for the owner, Col. Geo. Truesdell. The new hotel will be heated by steam.

Newark, N. J.—Amos H. Van Hown has purchased lots No. 90 and 92 Bank street, s.s., between Washington and Plane streets, npon which he will erect a new five-story brick structure, to be joined to the building at 88 Bank street. Cost, $20,000. Architect, Thos. Cressey, 760 Broad street.

Brockton, N. Y.—O. W. Powell is building a new opera house on South street. The building will be heated by steam, and Mr. Powel expects to have it finished by Christmas.

Providence, R. I.—A new $80,000 block is to be erected shorty on the site of the Rhode Island Club Building, at the corner of Weybosset and Clemence streets, by the American Mechanics Building Association.

Lynn, Mass.—Ground has been broken for a splendid new railroad station to replace the one destroyed by fire.

Oxford, N. Y.—The new bank building at said place will be three stories high, with an Oxford blue stone front, and will cost $25,000. J. M. Wright, of Birmington, has the contract.

Jersey City, N. J.—Sealed proposals have been received at the office of the Board of Vital Statistics of Hudson County for the completion of the new brick hospital for contagious diseases at Snake Hill (now partially constructed). Plans and specifications may be seen at the office of the board, adjoining court house. C. T. T. Rooney, Sr., clerk; W. W. Varick, president.

Buffalo, N.Y.—H. E. Beebe & Sons have prepared plans for a seven-story fire proof building, to be erected on Main and Washington streets by Mooney and Brisbane. The building will be heated by steam and be provided with an electric light plant. The architets will have general supervision of the work.

Detroit, Mich.—The Building Committee of the Masonic Temple Association invite sealed proposals until August 25 for the erection of a Masonic Temple. Plans and specifications may be seen at the office of the architects, Mason & Rice, 80 Griswold street. Certified check for 5 per cent of amount of proposal must accompany bid. For further information address the architects.

Menasha, Wis.—The Brighton Beach Co. has been incorporated, with a capital of $85,000, to establish a summer resort. Twenty-five thousand dollars will be expended in cottages and improvements this season. M. H. Schoetz, of Menasha, is one of the incorporators.

Minneapolis, Minn.—The Central Market Building, recently destroyed by fire, will be rebuilt at once. Plans are being prepared by Long & Kees. T. B. Walker, president, Minneapolis, Minn.

New York, N. Y.—The members of the Coffee Exchange will take a vote on the proposition to raise a mortgage of $250,000 on their new property, adjoining the Cotton Exchange, on Beaver street. There is a mortgage of $40,000 on the lot now, and it is proposed to wipe this out and devote the remaining $210,000 to the erection of a handsome structure.

Batavia, N. Y.—It is proposed to make the most radical changes in the hospital building. A steam heating apparatus will be put in, and arrangements for better ventilation made. Also an addition to the hospital will be erected.

Providence, R. I.—The architect of the Board of Charities and Correction is engaged in the preparation of the plans for the county jail annex, which it is expected will cost about $350,000.

Cincinnati, O.—The Lincoln Club directors have decided to spend $25,000 in remodelling their club house. Architects have been asked for plans conforming to the present style and material.

Buffalo, N. Y.—Mr. Cary will erect a mammoth building on the old rink property. It is understood that the plans call for a very high structure, designed especially for office purposes. Mr. Mathews will erect a large business building on the lot adjoining the Arcade.

Lancaster, N. Y.—Architect Geo. J. Metzger has drawn plans for a new town hall. It will be 56 by 40 feet in dimensions, with a tower 110 feet high.

Baltimore, Md.—The Arctic Skating Rink Co. has leased a piece of property at the corner of 20th street and Lovegrove alley, where it proposes to erect a building at a cost of $75,000, to be used as an ice skating rink. The contract stipulates that the rink shall be ready January 1.

Philadelphia, Pa.—Another fire proof building is to be erected on Chestnut street, opposite the State House, by the Real Estate Title Insurance & Trust Co. It will be three stories high. The Chestnut street front will be treated in French renaissance and built of Lee marble; the rear front of brick.

Boston, Mass.—A new building will be erected at 194-200 Boylston street, owned by Geo. R. White, and formerly occupied by Vercelli. Shepley, Rutal & Coolidge have made plans for a building, 50 feet front and 148 feet deep, running through to Park Square. It will be built of Cleveland sandstone, four stories high, on Boylston street. It is proposed to erect an Arcade Building on the block bounded by Washington, Bromfield, Tremont and Winter streets. Estimated cost, $700,000.

Monmouth, Ill.—The United Presbyterian College will erect an auditorium and gymnasium at a cost of $20,000. J. B. McMichael, president.

Lansing, Mich.—The combined plan of Bell & Marble and E. A. Doyd has been selected for the new city building. The structure will be of red sandstone and cream pressed brick, and will cost $150,000.

Brookline, Mass.—D. H. McKay is to erect a brick block of five houses, each three stories high, on Naples Road to cost about $80,000. The houses will contain every modern improvement and convenience. They will probably be completed late in the fall.

Benwood Junction, W. Va.—The Baltimore & Ohio has decided to erect a handsome station, which is the terminus of three divisions of that road.

Manchester, N. H.—The four lodges Knights of Pythias have decided to erect a new six-story block there for lodge purposes.

Washburn, Wis.—The County Board accepted the plans offered by Orff & Jeral mon, of Minneapolis, for a new court house to cost $35,000.

Cleveland, O.—Messrs. Shepley, Rutan & Coolidge, Boston, Mass., architects, have drawn plans for a new fifteen-story granite building. Norcross Bros., of Worcester, Mass., the contractors and builders, have been awarded the contract. Their bid was $625,000.

Pittsburg, Pa.—J. W. Arrott has taken out a building permit for a six-story business block, with a frontage of 40 feet on Penn avenue and a depth of 120 feet on Barker's alley, Fourth Ward. The building will cost $47,000.

Bellevue, Pa.—Ground for the new Masonic Hall to be erected at Lincoln and Meade avenues has been broken. Messrs. Bald & Millar were awarded the contract. The building when completed will cost about $23,000.

Chicago, Ill.—105 East 26th street, Trinity Episcopal Church, corner of Michigan, Bould and 26th streets. Rev. John Rouse, rector, 2212 Prairie avenue.

Shepley, Rutan & Coolidge, 36 Washington street, architects. Taking bids; cost, $25,000; 35 by 90, two stories high, steam heat, electric lighting.

Washingon, D. C.—The contract for erecting a building for epileptic patients of the Government Hospital for the Insane, near Washington, will be awarded soon. The amount involved will be between $30,000 and $40,000. The National Capital Investment Co. will erect a seven-story and cellar office building at 462 Louisiana avenue, N. W., which will cost $350,000. To be built of Hummel stone and pressed brick, 150 feet deep, 80 feet high and 25½ feet front, with concrete foundation. S. H. Walker, architect.

Jacksonville, Fla.—Architect John R. Scott has drawn plans for a new opera house to be erected on Main and Duval streets, to cost $250,000.

Gouverneur, N. Y.—A hotel will be erected on Main street. It will be four stories high, partly of marble. Probable cost about $80,000. Messrs. Tregedawn & McCrea, of this place, and Arkell & Paine, of New York, can give information.

Norristown, Pa.—The Norristown Council has awarded to Shoffner Bros., of that borough, the contract for the erection of the new borough market. Their bid was nearly $50,000, not including stalls and heating. The building when completed will cost $60,000.

New London, Conn.—The plans for the new $75,000 United States Custom House have been approved by Secretary Carlisle and Postmaster Geneal Bissell, designated to consider the plans for the new Government buildings.

Manitou Springs, Col.—C. W. Parker, of the Barker House, is interested in the project of establishing a $600,000 sanitarium. It will be heated with either hot water or steam, and will be lighted from the company's electric plant. Electricity will be used in every way, as far as possible. Dr. J. S. Baer, of Philadelphia, is also interested.

Chicago, Ill.—The Seckner Contracting Co., 1234-79 Dearborn street, owners and architects. Taking bids; cost $250,000; 100 by 240 and 70 by 100; one, two and four stories high; brick stone and pressed brick; stone trimmings steam heat.

New York, N. Y.—Max Muller, architect, has drawn plans for two fivestory brick store buildings 25 by 91, at Nos. 514-516 East 12th street. Owners, Morris Wederman and Jacob Rosenbaum, of No. 18 East 115th street. To cost $36,000.

Fitchburg, Mass.—The House Committee on Public Buildings and Grounds has favorably reported to the House the bill introduced by Mr. Apsley for the erection of a public building at Fitchburg, to cost $75,000.

New York, N. Y.—Edwin W. Harrison has filed plans for a new five-story brick building at No. 319 Greenwich street, to cost $22,000.

Boston, Mass.—Boston is to have a new theatre on the site of the old Arena at Ferdinand and Iabella streets, South End. The theatre will carry its own electrical plant.

Tipton, Ia.—Sealed proposals have been received for the erection of a brick hotel and business block. Plans and specificatons may be seen at the office of the architect, H. W. Zeidler, Muscatine, R. R. Leach, secretary.

Minneapolis, Minn.—The Construction Committee of the Court House and City Hall Commission have decided to advertise for bids for furnishing the boilers for the new structure. Six are to be purchased. The six boilers will generate the steam for the heating plant in the building and to run the electric lighting plant.

Chicago, Ill.—458 Wabash avenue. Mrs. Carrie L. Mann, owner, care of architect. Cost, $50,000; 50 by 100, six stories high, steam heat.

Philadelphia, Pa.—Contractors have been invited to estimate on plans for the proposed improvements to the Lafayette Hotel. These alterations and additions were recently authorized bythe Orphan's Court. They are to cost about $50,000.

Clarksburg, W. Va.—Bids are being received at Clarksburg by the Traders' Banking Co. for the erection of a $100,000 opera house and business block. Hamilton Bros. are among the contractors who have put in bids.

Binghamton, N. Y.—At a meeting of the Board of Managers of the C. T. H. A. of A. A., held Monday, the plans submitted by Geo. A. Garnsey, editor of the National Builder of Chicago, for the home building were adopted. The building will cost $125,000 and will be built in this city.

Utica, N. Y.—The New Century Club will erect a club house.

Scranton, Pa.—The excavation for the foundation of the Hotel Jermyn, on the corner of Wyoming avenue and Spruce street, is rapidly progressing. Owner, John Jermyn.

Philadelphia, Pa.—A special committee of the Young Republicans contemplate the purchase of the property at 221 South Broad street for a new club house. To cost $65,000.

Charlotte, Mich.—The county of Eaton, Mich., will take immediate steps to rebuild the $100,000 court house which was burned on July 4. New plans will be adopted. Address County Clerk, Charlotte, Mich.

Attleboro, Mass.—The town's committee on building an armory for the Attleboro Light Infantry has voted to recommend that the town purchase for $5,500 a piece of land in the heart of the town and erect upon it an armory at a cost of $22,000. West & Gutter have drawn plans for the new militia armory to be located on the Sophronia Day property on Howard Street. The building will be constructed of brick, with brown stone trimmings and terra cotta work. Cost, $96,000.

Augusta, Me.—Separate proposals have been invited for steam heating and pumping for the new Masonic Temple. Plans of the building can be seen at C. W. Jones' office.

Leavensworth, Kan.—The owners of the Planters' Hotel have authorized the expenditure of $40,000 in renovating and rebuilding the house.

Northfield, Minn.—Carlton Congregational College, owners. Patten & Fisher, 50-115 Monroe street, Chicago architects. Contract not let; cost $25,000, two stories high, steam heat.

New York, N. Y.—The Young Men's Christian Union has purchased a site, corner of Westchester and Bergen avenues, on which they will erect a handsome building, to cost from $75,000 to $100,000.

MILLS AND FACTORIES.

Bath, S. C.—Mr. Chas. Estes, ex-Mayor of Augusta, Ga., will soon begin the erection of a $300,000 cotton factory.

Togua, Me.—Proposals have been received at the Eastern Branch National Home for Disabled Volunteer Soldiers for furnishing one horizontal tubular steel boiler, 16 feet 3 inches long and 60 inches in diameter, with ninety 3-inch tubes, to sustain 100 pounds pressure; to be furnished with steam gauge, safety valve, gauge cocks, water guage connections, etc., cast iron front, grate bars, with all other castings required, and delivered at station of Maine Central R. R., Gardner, Me.

Louisville, O.—Sealed proposals will be received until August 23 for the following items required in the construction of a pumping station and chimney: For furnishing and erecting pumping machinery; boilers and foundation for the same; for complete plant, including one 750,000-gallon pumping engine, or for complete plant, including two 500,000-gallon pumping engines. F. E. Favret, clerk, Louisville L. E. Chapin, engineer, Canton.

Chicago, Ill.—79-81 Fifth avenue. E. S. Pike, 64 Dearborn street, owner. Howard & Shaw, 206 Groveland avenue, architects, taking bids. Cost, $40,000. Nine stories; 34 by 81; stone, brick, architectural and galvanized iron; iron stairs; steam heat.

Cardington, O.—Proposals will be received for electric light plant complete, or engines and boilers separate from the plant.

Buchanan, Mich.—The Lee & Porter Axle Works will locate here. A site has been selected and two brick buildings, each 50 by 75 feet, will be at once erected. Over $35,000 will be expended on them.

Cleveland, O.—The James U. Smith Plumbing and Heating Co. has been incorporated—capital, $25,000—for the manufacture and sale of plumbing, heating and gas fitting goods and supplies. Messrs. James J. Lynch Smith, Philip L. Kesseler, F. E. Dellenbaugh.

Fair Haven, Conn.—The Poppowitsch Electric Company, of 215 Java street, Brooklyn, N. Y., will shortly remove its factory to New Haven, where in all probability a new factory will be erected, land having already been purchased for that purpose.

New York, N. Y.—John Kehoe has purchased the houses at Nos. 73 and 75 West Houston street for $70,000. The houses will be torn down and a new building for manufacturing purposes will be erected in their stead. James Kilpatrick, of 58 East 11th street, will erect a five-story brick factory at Nos. 320 and 322 East 95th street, to cost about $30,000.

Lowel, Mass.—The old structures that line the canal on Western avenue, from its junction with Thorndyke street, are being removed. They will be replaced by a modern substantial wooden block, three stories high and 210 feet long.

Carey, O.—Sealed proposals will be received by the trustees of the Water Works for the construction of a complete system of water works. A brick pumping station, two compound duplex pumps of a capacity of 500,000 gallons, furnishing and setting up complete, two steel tubular boilers, including boiler feeder. Henry Hart, city clerk.

Youngstown, O.—The Andrews Bros. & Co. are contemplating the erection of a new sheet mill structure, to cost about $30,000.

Lafayette, Ind.—Thieme & Wagner Brewing Co., owners. Wolk Lehle Co., 560 Halstead street, Chicago, architects, taking bids; cost, $75,000; six stories.

Minneapolis, Minn.—C. Birkhofer Brewing Co., owners. The Wolk Lehle Co., No. 560 Halstead street, Chicago, architects. Taking bids; cost, $100,000; five stories high.

New Britain, Conn.—Stanley Rule & Level Co. will erect a new building, 80 by 50 feet, and 25 feet high.

Morris, Ill.—Sealed proposals have been received for furnishing materials and constructing a system of water works. Brick pumping station, two pumps of a combined capacity of 2,000,000 gallons per day, two boilers, etc. J. N. Bunnell, U. C. Davis, Fire and Water Commissioners.

Champaign, Ill.—F. G. Brown has competed plans for the erection of a new boiler house for the new steam heating apparatus to be put in the court house. Bids will be asked for at once.

Reading, Pa.—The plans and specifications of the Wildholm Bicycle Works have now been completed by Architect Droibolbis, and work will be pushed henceforth. Morris Hackman, contractor.

Marshall, Minn.—Sealed proposals have been received for the construction of a combined water and light plant for the village. A steam power plant, comprising boiler, engine and pumps, set complete for use; one electric light plant. E. T. Matthews, Recorder.

Toledo, O.—The Board of Commissioners of Lucas County, Ohio, have received sealed bids for two high-pressure tubular stationary boilers, rated at 80 horse-power each, to be placed in the boiler house of the Lucas County Infirmary in place of the old. Chas. H. Jones, county auditor.

Buffalo, N. Y.—The Magnus Beck Brewing Co. have been granted permission to construct a $40,000 addition to their brewery on North Division street and Spring street. Architect Otto O. Wolf, of Philadelphia, Pa., has prepared plans. To be 89 by 37 feet, one and three stories, built of brick and stone.

Jerseyville, Ill.—D. B. Turnbull and Robert Newton will incorporate a company to manufacture wagons. Capital, $150,000. It is proposed to erect a building with a capacity of making 6,000 farm wagons annually.

Pontiac, Ill.—Stone Shoe Manufacturing Co., Pontiac, owners. Cost, $35,000; 40 by 150, three stories high, brick, stone, stone trimmings, architectural and galvanized iron works, steam heat, boilers, engines, machinery.

Pittsburg, Pa.—A building permit was taken out by J. W. Arrott for a six-story manufacturing building in the rear of the lot formerly occupied by Trimbel's Varieties on Penn avenue. The new building will have a frontage of 53 feet on Barkey alley, and run back 100 feet. To be built of brick and stone and to cost $35,000.

New York, N. Y.—Geo. Abendscher has filed plans for a five-story brick factory, 100 by 50, at the southwest corner of Brook avenue and 134th street, costing $30,000.

Boston, Mass.—A building is to be erected on Wales Wharf, in the rear of 266 Federal street, from plans of Benj. Fox. To be built of brick, four stories high, 209 feet front by 38 feet. It will be used for light manufacturing and will cost about $25,000.

SCHOOLS AND COLLEGES.

Scranton, Pa.—The Board of Control has purchased an additional frontage of 25 feet on Rebecca avenue, near Jackson street, for the erection of No. 19 School, according to plans and specifications prepared by Davies and Houpt and at a cost of $30,000.

Bridgewater, Conn.—The Bridgewater Normal School has secured an appropriation of $75,000 for the erection of a building for manual training, kindergarten and drawing departments, and better facilities for the practice school, not over $45,000 to be expended this year.

Philadelphia, Pa.—Contracts for three new school houses have been awarded at joint meeting of Council's Committee of the Board of Education. A 21-division school will be built in the First Ward, at 5th and Porter streets, by J. Wensolberger, at a cost of $68,220. The same contractor will build a new 12-division school in the Twenty-seventh Ward, at 46th street and Woodland avenue, for $50,265, and a new 15-division school in the Thirty-third Ward, at Howard and Tioga streets, for $36,547. Geo. L. Harvey has been awarded the contract for the new school on 13th and Norris streets, for $61,000. The new school will be built of stone, containing rooms for 15 divisons.

Malden, Mass.—Both branches of the Malden city government met to consider the question of appropriating $100,000 for the new school building. It was referred to the Finance Committee.

Bayfield, Wis.—Bayfield has voted $25,000 for the erection of a school house.

Dedham, Mass.—Sealed proposals addressed to Frederick D. Ely, chairman of the Building Committee, and endorsed proposals for the erection and completion of a grammar school on the Avery school house lot, lately enlarged on High street will be received at the office of the superintendent of schools, Memorial Hall Building. Specifications and plans may be seen at office of superintendent of schools and at office of the architects, Messrs. Hartwell & Richardson, 62 Devonshire street, Boston.

Geneva, Ill.—State of Illinois Building Commission, Springfield, Ill., owners. Mayo & Curry, 1611 Unity Building, Chicago, Ill., architects. Contract not let; cost $60,000, three stories, steam heat.

Gas City, Ind.—Plans have been prepared for the erection of a $20,000 school house.

New York, N. Y.—A new school house will be erected on 4th street, between Avenues B and C.

Boston, Mass.—The report of the Franklin Fund trustees, including the Board of Aldermen and three ministers, on the subject of trade schools, is in course of preparation, and will be ready for publication at an early date. The fund amounts to about $350,000, only a portion of which, however, will be expended in the erection of the experimental school.

Plainfield, N. J.—The first application of the new law by which the Plainfield School Board has to secure the consent of the Common Council before it can proceed to levy for funds for building new school houses was made July 18, when the board made formal application for $70,000 for the construction of a new high school on the Wadsworth property purchase. The Common Council will act at its meeting.

Martin's Ferry, O.—An election will be held to vote on the question of issuing bonds to the amount of $30,000 for the purpose of erecting a school building.

Philadelphia, Pa.—A new public school will be erected southwest corner of Fifth and Porter streets, in the First Section. Also a new public school will be erected corner of 26th and Woodland avenue, in the Twenty-seventh section. An addition will be built to the Franklin School, in the Twenty-sixth Section.

Cincinnati, O.—The Board of Directors of the University of Cincinnati, O., will receive bids for engine, boiler, smoke connections, fan and heater, register and valves, pump and receiver, pipe connections, required for the heating and ventilating plant of the main structure of the new university buildings. Drawings and specifications can be seen at the office of S. Hannaford & Sons, 6th and Vine streets, Cincinnati. James H. Robinson, clerk of committee.

Elizabeth, N. J.—City Council has voted to issue bonds to the amount of $20,000 for the erection of new public school buildings in the manufacturing distirct of Elizabethport.

Buffalo, N. Y.—The sub-commtitee on Schools agreed to report to the Council a recommendation that a site with a frontage of 200 feet on Jefferson street and 219 feet on Madison street be chosen for the new East Side High School.

Boston, Mass.—Address Alderman Barry regarding the movement on foot to erect a $90,000 ten room schoolhouse in South Boston.

Brockton, Mass.—The Joint Standing Committee on Public Property will receive sealed proposals at the office of Superintendent of Buidings for buiding a four-room brick building on the Perkins lot; for buiding a four-room brick building on the Harvard lot; for heating and ventilating and sanitaries in the Perkins, Howard and Cary School buildings; for building a cellar and grading on Harvard lot. All according to plans and specifications on file at the office of the Superintendent of Buildings, corner of Franklin and Montello streets.

Yonkers, N. Y.—The Common Council has authorized the issue of school bonds to an amount not exceeding $42,000 to pay for a site and a new schoolhouse in the First Ward. These bonds will be delivered to the Board of Education.

New York city.—Messrs. Thos. Cockerill & Co., builders, have been awarded the contract for the new school building on the Fox estate, their bid being $37,000. Work will be commenced at once and the school will be ready for occupancy on January 1, 1895.

Trenton, N. J.—The Property Committee of Pe die Institute has decided to erect a new building as soon as possible. It will be of brick, 60 by 90, and three stories high, to cost $20,000.

New Haven, Conn.—The phenomenal growth of the Sheffield Scientific School has required enlargement of its buildings and plant. Messrs. Cady, Berg & See have been directed to prepare plans for a new laboratory. It is to be five stories high. The exterior is to be of North Haven brick, with dressings of East Haven stone and terra cotta. To cost $125,000. (Chemical Laboratory.)

Annapolis, Md.—The School Committee will erect a new school building, for which the city will issue bonds to the amount of $30,000.

Mt. Vernon, N. Y.—There will be a meeting of the commissioners of the Board of Education, to which have been referred the plans received for a new $30,000 schoolhouse in East Mt. Vernon and a $20,000 annex to the 6th street schoolhouse

Winsdor, Ont.—Tuscarora street, Windsor, Ont. Board of Education. J. A. Maycock, Fleming Building, Windsor, architect. Contract not let; cost $22,500, 59 by 87, two stories high, galvanized iron work, undecided heat, electric work.

Worcester, Mass.—One of the bidders for the contract of constructing the Dartmouth street school house was John B. Murphy, whose price was $24,960, exclusive of the plumbing.

Gallatin, Tenn.—The corner stone of the Pythian University has been laid. The main building will cost about $200,000. The structure is of classic design, 357 feet in length, 100 feet deep and four stories high.

Syracuse, N. Y.—Architect C. E. Colton has completed the plans for the new schools for the Fourth and Ninth Wards. The Fourth Ward School will be built of light brick, with stone trimmings, and will contain twelve rooms. The Ninth Ward School will be built after the same plan.

Pittsburg, Pa.—Sealed proposals have been received by Chas. Reisfer, Jr., secretary Central Board of Education, 516 Market street, for the construction of a school building at corner of 5th avenue and Miltenberger street.

Newark, N. J.—Address Commissioner Quinn, chairman of School House Committee, regarding two new schoolhouses to be erected.

Jamaica, L. I., N. Y.—Plans for a normal school building of stone and brick, to be erected upon the site recently approved by the State authorities, have been invited. R. C. McCormack, president. John H. Brinckerhode, secretary.

Allegheny, Pa.—Plans for the new school building on Webster street drawn by Architect E. J. Peoples have been accepted. The building will cost between $65,000 and $70,000.

Riverside, O.—The School Board has accepted plans for the erection of an $18,000 schoolhouse.

Scranton, Pa.—Sealed proposals have been received at the office of the secretary of the Scanton Board of Control for the construction and completion of a twelve-room school building, to be known as No. 27, and to be located on Columbia avenue and Boulevard, First Ward, in accordance with plans and specifications in the hands of E. L. Walter, architect. Eugene D. Fellows, secretary, Scranton Pa.

East Orange, N. J.—The Board of Education of East Orange is about to build a new public school in connection with the Elmwood school. Will be built on either South Clinton or Burnet streets. Will be of brick, to cost about $40,000.

Philadelphia, Pa.—Will erect a new school building to cost $75,000 at Fifth and Porter.

CHURCHES.

Fort Lee, N. J.—Arcihtects Wm. Schiekel & Co., of New York, are preparing plans for a one-story brick and terra cotta chapel for the Institute of the Holy Angels, to cost $50,000.

Dobbs Ferry, N. J.—Ground has been broken for the new Summerfield Methodist Church, which is to be erected on Broadway; 36 by 40 feet. The trimming will be of brownstone. The building is expected to cost $30,000.

Waterbury, Conn.—Bishop Tierney officiated at the laying of the corner stone of the new German Catholic Church that is in course of erection in Waterbury. The church will cost $27,000.

Moorstown, N. J.—The plans for the new Roman Catholic Church building are ready. The erection will begin next spring, and the cost will be about $30,000.

Brooklyn, N. Y.—Workmen have been engaged for weeks in excavating a large plot of ground at Schermerhorn street and Third avenue for the foundations of the new building for the First Baptist Church, of which Rev. Cortland Myers is pastor. The new structure will be known as the Temple. Its auditorium will have a larger seating capacity than that of any other church in New York or Brooklyn. The church will cost $100,000. Architects are Weary & Kramer, 1 Madison avenue. Structure to be in the Norman Gothic style. It will be constructed of rain washed brick, with terra cotta trimmings, etc.

Milwaukee, Wis.—A site has been purchased on Island avenue and Wright street for the erection of a new Episcopal Church. It will be called St. Edmund's, and will be a memorial of Bishop Armitage. C. B. B. Wright, rector in charge.

Chicago, Ill.—Corner of Ashland Boulevard and Harrison street, Ashland Boulevard. M. E. Society, care of Architect Harry Richards, 522 Dearborn street. Figures will be taken next week; cost $50,000, 72 by 100, one story high, steam heat, electric lighting.

Galveston, Tex.—Bids are invited for the construction and completion of an Episcopal Church The exterior to be of stone, combined with the necessary brickwork backing to produce the essential external and internal effects as shown on the plans. Bids will be received for masonry work and carpenter work separately, or the entire work. Bids must be left at the office of N. J. Clayton & Co., architects. J. P. Bowen, chairman Building Committee of Grace Church.

New York, N. Y.—Plans have been drawn by John B. Lubfritz, architect, for a new church, Melrose Avenue, northwest corner of 150th street, to be built of brick and to cost $30,000.

Bedminister, Pa.—Architect M. B. Bean, of Landsdale, has completed plans for the new church to be erected by the Reformed and Lutheran congregations jointly, to cost about $12,000, to be erected at the place called Kellor's Church, in Bedminster township.

Kansas City, Mo.—The South Side Christian Church is preparing to build a house of worship at 22d street and Prospect avenue. Architect E. E. Hills is preparing the plans. The cost will be about $12,000. Vrydagh & Shephard are preparing plans for a Catholic Church at Westport for the Redemptorists, to cost about $12,000. Rev. Benedict Heithart, Kansas City (Westport).

Albion, N. Y.—The corner stone of the new Pullman Memorial Church has been laid. The cost is $150,000. The plans for the church were prepared by Architect S. S. Boman, of Chicago. The church is a gift to the Universalist Society.

Philadelphia, Pa.—The corner stone of the St. Ignatius German Catholic Church, at 43rd street and Wallace street, was laid July 8 by Archbishop Ryan. Church to cost $60,000.

Greensburg, Pa.—Baptist Congregation has purchased a site at 3rd and Vannear avenue, and will erect a brick edifice costing $12,000 to $15,000.

Pittsburg, Pa.—Ground has been broken for a new church for the Seventh Presbyterian Church. The new edifice will cost $12,000, be of brick, and have every modern convenience.

San Jose, Cal.—The M. E. Congregation, South, will soon commence the erection of a new church, at a cost of $20,000, to replace the one burned two years ago. The church will be finished by fall. Dr. Hannon, pastor.

New Haven, Conn.—The cost of the new First Presbyterian Church to be erected on Elm street near Orange will be about $150,000.

Dobbs Ferry, N. Y.—The contract for the new Summerfield M. E. Church has been given to Messrs. Mee & Mackey, of Yonkers. The new building, which will be on the site of the old one, will cost $30,000.

Milwaukee, Wis.—The congregation of Our Saviour's Scandinavian Lutheran Church have voted to adopt the plans of Architect Edward V. Koch for the new church edifice and parsonage to be erected at Scott avenue and 4th street, at a cost of $20,000. Construction will begin as soon as the contracts are let. The Building Committee is Rev. O. H. Leem, Andrew Seimes, O. Halberg and A. Museby.

Woonsocket, R. I.—John B. Fountain will commence some time in August to build a $50,000 brick and stone church for St. John's parish, Woodlawn.

College Point, N. Y.—Ground has been broken for the new building of the St. Fidelis Roman Catholic Church, at College Point. The building will cost $40,000.

Sewickley, Pa.—A new stone church will be erected by the St. Stephen's congregation on the southeast corner of Broad and Frederick avenues, on lot 100 by 280 feet. Rev. R. A. Benton, rector. Members of Building Committee, F. B. Smith, D. C. Herbst, James L. Patty and others. Architects are Bartberger & East.

Fall River, Mass.—Sealed proposals have been received at the office of Chas. H. Farnum, architect, Fall River National Bank Building, for the erection of a church for the Bogle Street Christian Church Society.

Brooklyn, N. Y.—The St. Francis de Sales parish will erect a new church. Working under Father Barden is a Committee of Management, of which Valentine Brandt is secretary and T. G. Gorman is chairman.

Wayne, Pa.—An appeal is being made to the Ancient Order of Hibernians for financial aid toward the erection of a Catholic Church at Wayne, on lot donated by the late Geo. W. Childs, on condition that it should be occupied within three years by a church to cost not less than $25,000.

Amherst, N. B.—The corner stone of the new Baptist Church has been laid. Church will cost $30,000. Rev. Mr. McDonald, assistant pastor.

Chicago, Ill.—Stewart avenue, near 66th street, Englewood. Rev. Hugh Spencer Williams, pastor. First Cumberland Presbyterian Society, owners. F. J. Norton, 1428 Masonic Temple, architect. On the boards cost $35,000, two stories high, brick, stone trimmings, electric lighting, boilers, etc. La Salle avenue and Goethe street, North Side Hebrew congregation, owners. S. S. Eaman, 507 Pullman Building, architect. Bids are in; cost $50,000, 60 by 110, one story high, brick, stone, steam heat.

Coatesville, Pa.—Workmen have begun tearing down the old Trinity Episcopal Church in Coatesville, on the site of which a new building is to be erected at once, to cost $25,000.

Utica, N. Y.—The corner stone of the new St. Patrick's Church has been laid by Right Rev. R. A. Ludden, bishop of the diocese.

Philadelphia, Pa.—The Bethany Church will be improved. A new boiler house is to be erected in the space between the schoolrooms and the church; for the present, eight boilers, four under each building. The total cost of the alterations will be $30,000.

Philadelphia, Pa.—A brick and stone Sunday school building is to be erected on Seventh street and Woodland avenue for the Paschal Methodist Episcopal Church.

Chester, Pa.—Architect S. Hudson Vaughn, Mays Landing, N. J., with branch office, Fo. 9 West 5th street, Chester, is preparing drawings for a new A. M. E. Church, on Engle street, South Chester, to be built on the site of the old building.

Reading, Pa.—Architect, Chas. W. Bolton, of Philadelphia, has completed plans for a brick and stone Reformed Church at Reading, Pa. Also for the West Park Presbyterian Church, at 54th street and Lansdowne avenue.

Philadelphia, Pa.—A permit has been issued to Superintendent Jos. Achuff for the erection on Sepviva, Pepper, and Tucker streets of a two-story brick church building for the Wesley Methodist Episcopal congregation, to be 56 by 89 feet.

Brooklyn, N. Y.—Ground has been broken for the German Evangelical Lutheran Church of St. Luke, to be built in Washington avenue, between Willoughby and DeKalb avenues, building to be 104 by 70 feet and to cost $60,000.

Decatur, Ill.—The Official Board of the First M. E. Church Society has decided to improve their church. The auditorium will be remodelled and improved methods of heating and ventilating will be adopted. Cost, $15,000. Milton Johnson.

TRADE NOTES.

A Preliminary Meeting for the formation of a society of heating and ventilating engineers was held at the office of HEATING AND VENTILATION, 145-146 World Building, New York city, Thursday, August 2, 1894. Among those present were: O. C. Breckenridge, of the N. E. Engineering Co., Boston, Mass.; Edw. A. Munroe, with John A. Scollay, Brooklyn; Morris S. King, of the Wells & Newton Co.; Percival H. Seward, of the American Boiler Co.; Albert A. Cryer, of A. A. Cryer & Co.; F. P. Smith, 605 Metropolitan Building; Thos. Barwick, with E. Rutzler; W. B. Wilkinson, of the Howard Furnace Co.; W. A. Russell, of the Niagara Radiator Co.; W. M. Mackay, of Hart & Crouse; Albert A. Cary, of Abendroth & Root; James A. Harding, of the Boynton Furnace Co.; Geo. B. Cobb, of Geo. B. Cobb & Co.; Hugh J. Barron, of the Barron Steam Heating Co., and L. H. Hart and H. M. Swetland, of HEATING AND VENTILATION, all of New York city. Mr. Fred. P. Smith was elected temporary chairman, L. H. Hart being elected temporary clerk. Discussion as to best methods of forming the society, in which all participated, followed the election of the temporary officers. The clerk read extracts from rules of other societies, as to the necessary qualifications to become a member of them. H. J. Barron moved that a committee of five on organization be selected, and a committee of three be appointed to select such a committee. Mr. Barron's motion was carried and Messrs. Cary, Cryer and Mackay were appointed as a special committee to select the members of the committee on organization. Shortly after retiring this committee reported the following selections for the committee on organization, the selections meeting with general approval: Messrs. Fred. P. Smith, H. J. Barron, James A. Harding, W. M. Mackay and A. A. Cary. Letters from prominent heating and ventilating engineers throughout the country were read, nearly all of whom favored the idea and thought such a society would be productive of much good. The motion made by Mr. Cary that those present be made charter members and sign a paper to that effect was carried, and all present signed. This does not bar out those from whom letters have been received, and who wish to join, the number of charter members being left to discretion of the committee on organization. As there was no further business before the meeting it was adjourned to September 10, the committee on organization being authorized to issue invitations and select the place of the next meeting.

The following are a few of the gentlemen who have written to the temporary organizers, favoring a society of heating and ventilating engineers: Chas. S. Onderdonk, Onderdonk H. & V. Co., Philadelphia, Pa.; George W. Kramer, Weary & Kramer, New York and Akron, O.; D. F. Morgan, Philadelphia, Pa.; E. P. Waggoner, Syracuse, N. Y.; Prof. S. H. Woodbridge, Boston, Mass.; T. J. Waters, chief engineer of the Board of Education, Chicago, Ill.; Henry B. Prather, Buffalo Forge, Co., Buffalo, N. Y.; Guy Tilden, Canton, O.; James R. Willett, Willett & Pashley, Chicago, Ill.; Prof. J. H. Kinealy, Washington University, St. Louis, Mo.; C. S. Hopkins, Electric Boiler Co., Rochester, N. Y.; Stephen Ransom, New York; Percy N. Kenway, H. and V. Engineer, Boston, Mass.; Clarence K. Prince, The H. B. Smith Co., Westfield, Mass.; M. E. Dean, care of Herendeen Manufacturing Co., Boston, Mass.; D. P. Gosline, Boston, Mass.; John Gormly, Philadelphia, Pa.; C. W. Light, Eureka H. & V. Co., Saginaw, Mich.; John D. Hibbard, The John Davis Co., Chicago, Ill.; Geo. P. Steele, Philadelphia Pa.; Andrew Millegan, Green & Wickes, Buffalo, N. Y.; E. R. Burroughs, Herendeen Manufacturing Co., Geneva, N. Y.; Walter B. Snow, B. F. Sturtevant Co., Boston, Mass.; F. Tudor, Boston, Mass.; Wm. Vanderman, Williamantic, Conn.

A great many gentlemen who are perfectly competent and who would doubtless be willing to join this society, did not receive any notification regarding this temporary meeting, and we desire to say to them that only about 50 letters were sent out for an expression of opinion, and only about 20 invitations were sent to gentlemen in New York to be present at the temporary meeting. These invitations to talk the matter over were sent out Wednesday night for Thursday's meeting, and an attendance of 16 out of the 20 persons invited shows the great interest taken in the formation of such a society and the widespread belief that it will be a valuable organization for the advancement of our industry. The cost of membership and the qualifications necessary to become a member will be decided at the next meeting. All gentlemen who are competent engineers in this line of work, and who desire to become charter members should send their names and qualifications to the committee on organization (care of the office of this journal) who will give the matter careful consideration.

The Master Steam Fitters, of Newark, N. J., have formed a local, with Edw. Hunne as president, T. B. Cryer as vice-president and Cornelius Sullivan as treasurer.

The Windsor Heater Co., of Galena, Ill., have elected the following officers for the year: J. W. Westwick, president; W. W. Stillman, vice-president; Dr. F.B. Fowler, secretary and treasurer.

The firm of Giblin & Co., Utica, N.Y., have run their factory continuously this year, except for a short shut down for July inventory. Their boiler business has shown special growth, and they are well satisfied with the outlook for the future.

Mr. J. E. McElfatrick, formerly New York manager of the Detroit Heating & Lighting Co., has been engaged by the United States Heater Co. He will represent that company in Ohio, taking the place of Mr. Frank P. Hamilton, who has taken a position with the George Worthington Co., of Cleveland.

Mr. Robert Munro, formerly representing the American Boiler Co., of Chicago, in Pennsylvania, is out with a circular announcing that he will in future represent in the same territory the line of boilers and hot water steam specialties manufactured and sold by the Ideal Boiler Company, of Chicago. He claims for the Ideal boilers that in them are embodied features which imitate no heater in the market, but improve materially some of the boilers which have been most prominently and favorably known to the trade. Mr. Munro has been for a long time identified with the hot water heating business, and the Ideal Co. are singularly fortunate in securing so strong a man to represent them in that territory.

Tuerk's new changeable blade ventilating fan, manufactured by the Tuerk Water Meter Co., Fulton, N. Y., is an improvement in which our readers will no doubt be interested. To change the angle of the blades, all that is necessary is to loosen the screws, shift one of the blades to the angle desired, and all the others will move correctly in the same direction at the same time. The screws are then tightened to prevent shifting. By this method of adjustment, the fan can be made to exhaust or bring in fresh air at the pleasure of the operator. Another good feature is that the blades can be adjusted so that small electric motors, or light power where the belt will stand but a slight strain, can be used, the fan at the same time delivering a large quantity of air. We hope to present an illustrated description of the fan next month.

While we are obliged to our esteemed contemporary, Domestic Engineering, for the very kind notice they gave us regarding the new society of heating and ventilating engineers, we feel that the title under which the notice was given, viz.: "A New Steam Fitters' Association," may cause some misunderstanding. The new organization will not embrace the master steam fitters, except in a few cases, the idea being to bring together engineers, and others engaged in furnace and combination work who possess certain qualifications, the character of which is yet to be determined and will be discussed at the next meeting on September 10, when the Committee on Organization will bring in recommendations. The main object of the new organization will be the diffusion of knowledge through the presentation and discussion of scientific and practical papers on heating, ventilation and allied subjects by which a rapid general advancement of the science will be secured. The opportunity for the discussion of practical work afforded by a society such as is proposed would be of incalculable benefit, and would bring into prominence the engineers and their work and give to it and to them a dignity heretofore unknown.

Mr. W. F. Gilling, formerly manager for Le Bosquet Bros., of Boston, has become associated with the New York office of the American Boiler Co., 94 Centre street, and will travel in their interests in the New England States, where he is well and favorably known, both as an expert engineer and as a jolly good fellow.

If you are interested in foot warmers, as attached to steam or hot water radiators, send for the new circular of the America foot warmer, just issued by the America Heating Co., Rockford, Ill. The value of this warmer is that it can be easily attached to a new or an old apparatus and connected to either end of a radiator. It vents itself, and is therefore filled throughout with water.

The Fox Furnace Co., of 28 Vincent street, Cleveland, O., have just issued a new catalogue showing the advantages of their new smoke-consuming furnaces for soft coal. Slack or any cheap grade of coal can be used in these furnaces with perfect success, the company guaranteeing them fully. Owing to the great interest now being taken in methods of burning soft coal, the trade will perhaps be glad to know that this catalogue will be sent free by mentioning this journal.

Giblin & Co., Utica, N.Y., manufacturers of the well-known Standard furnaces and combination heaters, send us a slip which they are inserting in their lately issued catalogue, and which describes their Little Giant steam heater, giving the dimensions, capacities, prices, etc. with a table for ascertaining the required amount of radiation for heating different classes of rooms and buildings. The heater has given satisaction wherever introduced, and all of our readers who have not received the slip above referred to should send for one at once. It will gladly be furnished free upon request.

The A. A. Griffing Iron Co., of Jersey City, N. J., call especial attention to the "Bundy" Major improved elastic coupling through circulars showing by illustration the old and the new way of coupling pipes. They are also sending to the trade illustrated circulars of Bundy full opening radiator valves, Bundy comfort foot rest, Bundy Pyro radiator, Bundy Renaissance radiators, Bundy enamels, Bundy separable mercury thermometers, hot water expansion tanks, floor and ceiling plates, etc. They have also prepared special circulars on Bundy return tank and steam traps; in fact, are really prepared to supply a line of special goods of use in the trade, not carried by any other company, and which are the best of their kind.

The Ideal Boiler Co., 36 Dearborn street, Chicago, Ill., are sending out the following circular to the trade: "Replying to the frequent letters addressed to us asking when the Ideal steam boilers will be ready for the market: We now expect within thirty days from this date to have ready for delivery a full line of these steam boilers. Catalogue and price list is in preparation, and we confidently bespeak for this boiler the same popularity that has attended the introduction of the Ideal hot water heaters. The favor accorded this hot water heater by the best steam fitting trade in the country has been without parallel in the history of the boiler business, and a word in explanation of this may not be inappropriate. First, the promoters of this enterprise have been so conspicuously identified with the manufacture of hot water heating apparatus that it was the logical conclusion that any boiler brought out by them was calculated to be an improvement over existing types. The simplicity and durability in the construction of the Ideal appealed at once to the trade. In no other boiler is the circulation so free and unimpeded; again, the boiler is constructed without packed joints, and the push nipple, so popular in the construction of radiators, proved a strong taking point with customers. It has not been necessary to undersell others, but a price corresponding with that of the best known boilers has been steadfastly maintained. The experienced steam fitter realizes that in no case is a contract secured or lost on account of the difference in the price of boilers. To reduce prices is the resort only of those who either seek to introduce into the market goods of inferior quality or to retain in the market goods of failing reputation. The Ideal steam boiler will possess all the improvements and advantages of the Ideal hot water heater."

A Class in Steam and Hot Water Heating will be one of the features of the work of the New York Trade School, First avenue, Sixty-seventh and Sixty-eighth streets, New York, during 1895. The catalogue of this institution gives the following particulars regarding the course: A three months' day course of instruction in steam and hot water heating will be commenced on January 2, 1895. Certificates will be awarded on April 4 to those who pass the examination, which is held during the last week of the term. The instruction will be given every day from 8 a. m. to 4 p. m., except on Saturdays, when the school closes at 2.30 p. m.

Terms: Forty dollars for the course, paid when name is entered. Good board can be had at $5 per week. The class in steam and hot water heating will be under the supervision of the Trade School Committee of the Master Steam and Hot Water Fitters' Association of New York, consisting of Messrs. John J. Smith, S. J. Geoghegan, Enoch Rutzler, J. D. Clarke, James Curran and Charles J. Gillis.

The instruction will be both practical and scientific. The manual part of the course will comprise work of the same nature as is done in establishments conducting a business of this character. The theoretical part of the course will be given by means of lectures, in which the scientific principles that form the basis of the construction of heating systems will be thoroughly explained. A part of this course will consist also of the drawing of plans. On each plan that is made the pupil will be required to show how the piping is to run, where the radiator or heating coils should appear and the proper place for the boiler or heater; also to give the sizes of pipes required, fittings, etc. Then from plans so prepared the work itself will be done.

Chas. S. Webster, Wm. G. Bollmer and Howard D. Watson are directors of the Zero Valve Co., just incorporated in Buffalo. Capital, $3,000.

John A. Eichar, Warsaw, Ind., has the plumbing and gas fitting of the new four-story building of the Red Men's Peashwa Tribe. Mr. Eichar is doing considerable work in the heating line also.

Fuller & Warren, of Troy, N. Y., know how to advertise well. Their latest is simply a card showing the P. P. Stewart stove, 1838—1894—2,000,000. Doesn't say much, but the illustration tells the story plainly.

The American Radiator Co. are prepared to furnish at all of their stores the favorite radiators manufactured by M. Steele & Co., Springfield, O., they having secured the exclusive sale of the company's product.

The Peck-Williamson Heating and Ventilating Co. is the name by which the former Bennett & Peck Heating and Ventilating Co., of Cincinnati, O., will hereafter be known, an amendment to their charter having been granted them.

The H. R. Worthington Co. have lately placed two large hydraulic elevator pumps, eight pumps for tank, boiler feeding and other services, and a 750-gallon underwriters' fire pump in the new Brown Building, Philadelphia, Pa. Business is better with this company.

The Building Committee of the Board of Education of Syracuse, N. Y., have recommended that the J. F. Pease Furnace Co. receive the contract for furnishing the necessary heating and ventilating apparatus for the twelve-room buildings, and the Howard Furnace Co. for the eight-room buildings.

"Isothermo" is the trade mark adopted by the Howard Thermostat Co., of Syracuse, N. Y., who manufacture the Howard automatic heat regulator. This company have just issued a new circular giving a full explanation of their apparatus, copies of which will be sent upon mention of HEATING AND VENTILATION.

Furnaces and Combination Heaters is the latest catalogue from Giblin & Co., Utica, N. Y. It tells all about the Standard, Standard, Jr., Rival, Rival, Jr., Standard Steel and Standard Smokeless furnaces. It is well illustrated, as is all the matter sent out by this company, and if any of our readers have not received one it will be sent on application.

Arthur De L. Neal was on July 1 made secretary of the Nason Manufacturing Co., of New York. We congratulate Mr. Neal, who has worked his way up to his present position by strict attention and industry. The Nason Company, by the selection of Mr. Neal to the honorable position in their company now occupied by him, show their appreciation of worth and merit.

The Electric Heat Regulator Co. of Minneapolis, Minn, send us some new and inviting reading matter regarding their automatic heat regulators, which, by their constant maintenance of a uniform temperature within doors by their unvarying control of fires, secure the best attainable results of a perfect combustion, from which a material economy of fuel must result. Full information free.

The New York Warming and Ventilating Co., 257 Water street, New York, through W. H. Knowlson, have secured the contracts for the new school at Ridgewood, N. J.; Woodside (L. I., N. Y.) Public School; Public School, West Orange, N. J.; Public School, Winfield, L. I.; two school buildings at Saratoga Springs, and one at Louisburg, N. Y. They are now at work placing the apparatus in the Thorne Memorial at Milbrook, N. Y. Most of these buildings will use the Fuller & Warren system.

The Powers Duplex Regulator Co., of 36 Dearborn street, Chicago, Ill., have just been awarded the contract for the automatic regulating of the heating system in a twelve-room school building now being erected in Evanston, Ill. They are also placing their system in the Ray School, in Hyde Park, Ill., under contract with the Chicago Board of Education. The great strides made by the Powers system of regulation in the larger buildings during the last year must be very satisfactory to the company.

One of the Largest Jobbing Houses in Paris has sent an order to the Raymond & Campbell Manufacturing Co., of Middletown, Pa., and asked for the entire control of France in the sale of the Sun steam and hot water boilers. As the house has branches throughout the Republic, definite arrangements will probably be made. Raymond & Campbell have a most complete equipped works, and their American business has steadily grown; and as their boiler is a most excellent one, there is no doubt of the continued increase in sales.

A First Glance at the outside cover of the new catalogue of the Standard Radiator Co., of Buffalo, N. Y., leads one to think that this work will not compare favorably with catalogues of other companies, but after one has looked over the beautiful printing inside and has seen how grandly the cuts stand out, and then compared the good stout cover in which the catalogue is bound with the cheaper ones before him, he feels inclined to congratulate the ingenuity which selected such a departure from usual customs, and say to every dealer, 'If you want a catalogue that you can refer to, and one that is always clean and nice, send for that of the Standard.'

A Local Paper of Utica, N. Y., says Russell Wheeler & Son, of that city, are meeting with great success in the manufacture of the Palace King hot water boiler. Tests up to 85 pounds to the square inch have been made possible without leakage by use of their lately patented nipple connection. The company are to be congratulated on the large number of contracts they are receiving in Utica, as the home market is always the hardest in which to win appreciation. Special attention is called to the heating of St. Joseph's Church, their hot water boilers replacing eight hot air furnaces. The church people, we understand, are much pleased with this new system.

The Large Scott Pop Safety Valve, 35 feet high, which was used by the Roe-Stephens Manufacturing Co., Detroit, Mich., at their World's Fair exhibit, has been placed upon the top of their factory, where it can be utilized for years to come as a sign of their business.

Geo. T. Barnes, of Newbugh, N. Y., has got out about as fine a catalogue on Richmond heaters as any one this season, it being tastefully illustrated, no expense being spared in making cuts, etc. Lots of people say Mr. Barnes does good work, and recommend him by their testimonials. He says he will send a copy of this catalogue to all fitters who are looking for a good boiler.

"A Written Guarantee accompanies every Peninsular furnace." Those are the first words that greet us in opening the new catalogue of hot water and warm air furnaces just issued by the Peninsular Stove Co., of Detroit. It is followed by "Hints to Furnace Buyers," illustrations of the Peninsular patent duplex grate, the Peninsular hot water and warm air combination, carbon furnace, and lots of other styles and types of heating apparatus manufactured by them. It's a small book, but good things come in small packages, and it's free. A postal card will get it. Better send for one and have it on file.

It is now a very generally conceded point that the seasoning of lumber by the progressive fan system of dry kilns is the most efficient and economical method. Very large kilns of this sort are no longer uncommon. It is seldom in very large dryers that anything but a ¾-housing fan is employed. With this style of fan, the horizontal type of engine, which is used for driving it, is readily accessible for oiling and repairs, on account of the lower scroll of the fan being underground, bringing the engine down low. The Menasha Wooden Ware Co., of Menasha, Wis., who employ in their plant over a dozen dryers, find it impossible to install a ¾ housing fan for the reason that their kilns for the most part are located on piles driven into low, marshy ground; in fact, close up to the water's edge, in order to facilitate handling the green timber. The largest full-housing fan ever employed for a lumber dry kiln was purchased by them of the Buffalo Forge Co., Buffalo, N. Y., about three months ago. The fan stands 150 inches in height, and is supplied with a direct acting double 10 by 10 cylinder engine, the working parts being entirely enclosed. A heater containing 14,000 lineal feet of 1-inch pipe is used in connection with the above fan. Although this engine runs continuously, and upon a foundation anything but solid, highly satisfactory results are obtained. The Menasha Wooden Ware Co., have just ordered of the Buffalo Forge Co., a duplicate of the above plant, stating that they are pretty well pleased with the apparatus that they now have, taking into consideration the special inducements which have been offered them by competitors. The apparatus referred to is the first Buffalo kiln installed in their immense works, although they have been using the fan system for a number of years.

L. B. Collins, treasurer of the Holland Radiator Manufacturing Co., has just returned from a trip through Ohio, and reports trade picking up through the State.

Hodge Bros., of 15 Chardon street, Boston, Mass., write us that within the last ten days they have had many inquiries for valves in large lots and have booked and shipped several large orders. All thier agents report inquiries from local trade for the valves. They also report that many leading architects are specifying the valves, and that several satisfactory orders have been receive d from Europe. Trade on their duplex dampers is also very good.

The Kernan Furnace Co., of Utica, N.. Y,. and 71 West Washington street, Chicago, favor us with one of their new catalogues of Kernan furnaces for soft coal. Considerable new matter as to burning soft coal, causes of imperfect combustion, etc., is furnished. Illustrations with explanation of the Kernan smoke consumer "A" series, follow, and the 'B" series is then described. A description of the patent hexagonal grate used in all these funraces is most interesting, while full directions for setting up and using the furnaces are given. Then follow testimonials and an interesting and comparatively new feature, viz., the printing of testimonials from the same persons "one year later," showing the continuous good work of the furnaces. The Kernan smokeless furnace was put on the market three years ago and was the first furnace of its kind. Our readers in the soft coal district should send for a copy of this catalogue in order to be up to date.

A Work of Art is the new catalogue we have received from the C. H. Bennett Furnace Co., of 289-291 Main street, Cincinnati, O., who manufacture heating and ventilating apparatus for public and private buildings. The manufacture of the Bennett warm air funraces covers a period of over forty years. The works have recenlty been enlarged, have every modern improvement, and are under the personal supervision of a member of the company. The new catalogue has a special treatise on school buildings, and the danger that lurks in the school room, followed by illustrations of the best that money could buy. Special information is also given on the difference between church and home heating, the expense of repairs, etc. In the construction of the new Bennett furnace the fact is recognized that if soft coal is to be burned economically and without smoke, it must first of all be decomposed into gases and coke; consequently the furnace has a coking chamber in which the coal undergoes distillation, and a combustion chamber in which the products of distillation are burned. By this process all the products of soft coal are burned, providing a fuel at $2.50 per ton even more serviceable than anthracite. This catalogue should be in the hands of every board of education and all heating engineers engaged in public building work, and will be sent on application, mentioning HEATING AND VENTILATION.

(*Continued on page xv.*)

THE CELEBRATED SANITAS TRAPS

ENDORSED BY SANITARY EXPERTS AND LEADING PLUMBERS.

SANITAS Traps are used unvented in many of the principal cities of the United States, making a great saving to the Plumber and to the user. The Sanitas is the only Trap that will stand both syphonage and evaporation and hold its seal under the most adverse circumstances. Plumbers interested in giving their patrons the best will invariably give preference to the Sanitas Traps Made in Lead, White Metal or Iron. Send for Special Circulars.

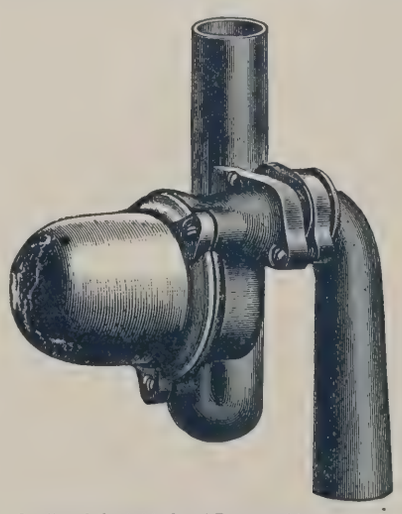


Fig. 9. Sanitas Adjustable Lead Trap, making a Full S-Trap.



Fig. 11a. Sanitas Brass Trap.

Smith & Anthony Co., MAKERS Sanitas Plumbing Appliance.

48 to 54 UNION STREET, BOSTON.

56 BEEKMAN ST., NEW YORK. CHICAGO AGENCY, 217 LAKE ST.

The Model Heating Co., of Philadelphia, have erected a 48-inch boring mill, made by the Bridgeport, (Conn.) Machine Tool Co., for facing the sections of their Novelty steam generators. They have also increased their moulding floors and erected two cranes thereon.

We Mentioned in one of our late numbers that P. J. Moran, of Salt Lake City, had secured the contract for the heating and ventilating of the Grant school. A late issue of the Salt Lake Tribune informs us that he has also secured the work to be done in the Poplar, Grove and Annex schools, that city, notwithstanding the fact that other bids were higher, showing the appreciation of his work.

The Holland Radiator Co., 69 Centre streeet, New York, are much pleased at the orders received by them since opening in this city, and have established a warehouse at 140 Centre street, in which they are placing as their first stock ten car loads of radiators. With cheap fuel, such as natural gas and coal at the door of their factories in Bremen, Ind., and Avonmore, Pa., they claim unusual facilities as to price and quality of goods.

Wright & Olsen, 27 New Montgomery street, San Francisco, Cal., is the name of the firm which succeeds to the business of Taylor Goodrich, dealer in ranges, furnaces, etc. The new firm will continue in the same line of business at the old quarters, where old patrons and prospective customers will be made welcome. Mr. Wright was for some time connected with the Powers Duplex Regulator Co., of Chicago, and is well known to a large number of our readers. The new firm would be pleased to receive catalogues and best discounts from concerns in their line of business.

Mr. W. A. Russell, who will represent the Niagara Radiator Co., of Buffalo, and the Detroit Lubricator Co., of Detroit, in New York in the future, is fast getting his offices at 89-91 Centre street into shape. The rooms have been tastefully papered and painted in colors to match the radiators, and the effect is most pleasing to the eye. In the center of the exhibition room is a very large rug of exceedingly fine texture, while grouped in most advantageous positions are the samples of "Niagara," the design of which, it will be remembered, is Louis XIV. On the center-table, samples of Detroit quick-opening hot water and steam valves, and Detroit Union elbows for the Union radiator valve, tempt the fitter and invite his careful inspection. Mr. Russel has had most unusual successs in selling these valves, although he has hardly got ready for an active campaign. The furniture is solid and substantial, of antique oak pattern. It is outside, however, that the eye of the passer-by is attracted. No matter which way he turns on Centre street, near this office, handsomely decorated signs reading "Niagara Radiator Co." greet his vision, the sign on the top of the building being 25 feet long, and the one between the rooms about 15 feet, but very wide. The lettering on each one is a credit to the artist who did the work, and to the designer, Mr. Russell. If hard work will "get there," we bespeak for the New York manager of the above companies a successful business.

The United States Heater Co., of Detroit, Mich., have arranged with Messrs. Janes & Kirtland for room to display their line of hot water and steam heaters, and desk room for their New York representative, Mr. J. L. Saunders. The trade is invited to call and examine samples of the above goods at 110 Beekman street, New York city, and communications sent to the United States Heater Co., at that address will receive prompt attention.

In connection with the description of the Kelsey furnace on Page 5 of our July issue, the statement is made that the combined area of the hollow sections of which the fire pot is composed was 37 square inches, whereas *each* section has this area, the smallest size furnace made having an area of 370 square inches of hollow air space for receiving the fresh air conducted to the furnace. As this feature is one of the essential points of the merit of the furnace, and one on which the manufacturers, the Kelsey Furnace Co., Syracuse, N. Y., lay considerable stress, it is hoped that this correction will set the matter right in the minds of any of our readers to whom the efficiency of the furnace may have been open to question.

The New Hot Water Boilers, which the Carton Furnace Co., Utica, N. Y., are putting on the market have already received recognition, having been specified for the new residence of J. Frederick Maynard, of Utica, now being erected in that city. As the house is a very large one, it will require two boilers in battery, allowing of disconnection, using only one in mild weather. Everything will be indirect except in the servants' apartments. Two cold air rooms will supply the indirect stacks. The supervision of the plant will be in the hands of Wm. Campbell, who has had 32 years' experience and whom we have mentioned heretofore as having been engaged by the company. The Carton Company has been in business since 1847 and has always been successful, so they are sure in advance that the merits of their goods will be looked into, and that within a short time they will be able to command a successful trade.

The Cortland Howe Ventilating Stove Co., Cortlandt, N. Y., whose great specialty is the Cortlandt Howe ventilator stove, send us their catalogue for 1894-95. It is neatly printed on a first-class quality of highly calendered paper and besides presenting some very good illustratons of their goods, sets forth their advantages in an attractive way. The Cortlandt Howe is a ventilating stove in which a constant supply of fresh air passes over heated portions of the stove into the room in which it is placed, the cold and foul air near the floor of the room being drawn into a flue in the stove, through which it passes into and out through the chimney, so that, although it is what may be termed a re-circulating stove, it differs materially from and is far superior to others in that it re-circulates pure air only. The stove is fitted with every modern improvement, and is ornamental in design. The catalogue contains some very strong testimonials, and those of our readers who are looking for a good thing in this line should write for a catalogue and judge of the merits of the stove for themselves.

The Missouri Gas Cooking, Heating & Lighting Co. has been incorporated at East St. Louis, Mo.

The DeKalb Furnace Co. has been incorporated at Portland, Me., with capital stock of $50,000. E. Dudley Freeman, secretary; L. Sayles, president.

The New York Office of the Deane Steam Pump Co. have duplicated the plant of the Madison (N. J.) Water Works, the first order giving unusually successful results.

The Little Cyclone Fan Co. is the name of a firm recently incorporated in Kansas City, Mo., with a capital stock of $10,000. W.T. Waite, W. W. McCall and Frank E. Weidman.

The Exeter Machine Works of Boston, Mass., have received the contract for furnishing a carload of Exeter ornamental steam radiators for Dartmouth College, Hanover, N. H., also order for carload for Governor Smith's block, Concord, N. H.

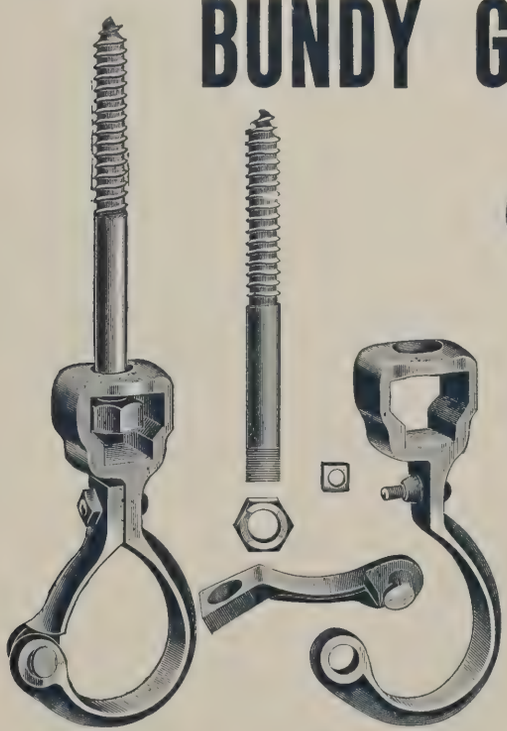
The McGuiness Smith Co. has been incorporated at Pittsburg, Pa., to manufacture and sell all kinds of hot water heating apparatus and ventilating appliances. Capital stock, $100,000. Directors, Wm. K. McGuiness, Allegheny, Pa.; Robt. S. Smith, Joseph A. Langdon and Wm. F. Hughes, of Pittsburg.

The Niagara Radiator Co., offices Buffalo, N. Y. (works North Tonawanda, N. Y.), send us one of their new folders giving a description of their new buildings, illustrated. They also call attention to the construction of their goods, the smooth nipple connection, and the dimensions—three important points. A cross sectional illustration calling attention to steam and air passages, shows the heating surface to all be prime surface. The New York office of the company is at 89-91 Centre street.

The Architect's Directory for 1894 has just appeared from the press of Wm. T. Comstock. It is put up in convenient shape and bound in red boards with gilt stamp, making quite a striking appearance. The work aims to give, classified by States and towns, all the architects in practice in the United States and Canada. In giving architects' names the membership in the architectural societies is indicated by figures in brackets following each name: (1) indicating membership in the American Institute of Architects; (2) the Architectural League of New York; (35) Royal Canadian Academician. This will be found a valuable feature, not only interesting to architects, but to those following up the work of associated architects. The influence of architectural associations in raising the standard of architecture in this country is well known, and this feature of the directory will be regarded important. A selected list of the principal dealers in building materials and appliances is also given, which will be found useful to architects. To manufacturers and dealers the list of architects will be found of great value in addresing circular and sending samples. Price, $1.

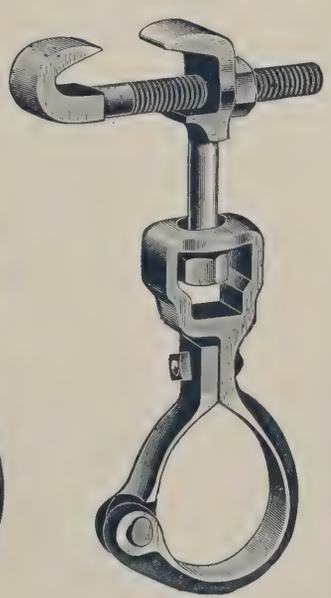
(*Continued on page xvi.*)

BUNDY GIANT PIPE HANGER.



No. 1 Closed, for wooden beams.

No. 1 Open and in parts.



No. 2 Closed, for iron beams.

Lock Hinge Ball Bearing.

Has fewer parts, is simpler, stronger, and possessed of more good points than any other pipe hanger made.

In screwing into a wooden beam the stirrup or hanger proper may be raised up, bringing the hexagon nut into the socket designed to receive it, when it may be screwed to place, gimlet fashion. When this is done the weight of the stirrup carries the nut out of the socket into the larger space above, where there is ample room for the hanger to swing in any direction, particularly so as the upper side of the nut and the part of the hanger with which it comes into contact is oval or dome-shaped, thereby making available the advantages of the **BALL BEARING FEATURE.**

The No. 2 Hanger, for attaching to iron beams, has the horizontal clamp adjustable to fit tightly any size of beam, and no bolt, which is a weak construction, is used as is generally the case in other hangers.

A sample Hanger will be sent free to reliable parties who are interested.

Manufactured exclusively by **A. A. GRIFFING IRON CO.,**

BRANCH OFFICES: { *Chicago. Boston. Philadelphia.*

WORKS: Jersey City, N. J.

NEW YORK, 15 Dey St.

The Sperl Heater Co., Carbondale, Pa., have erected a machine shop 38 by 65 feet, two stories high, and a boiler house 20 by 30 feet.

Exeter ornamental steam radiators, manufactured by the Exeter (N. H.) Machine Works, are being used in the Centre and Thaxter school houses at Highland and in a school house at Wellesly, Mass.

The W. H. Page Boiler Co., of Norwich, Conn., have secured the services of John Young, formerly with the Herendeen Manufacturing Co., of Geneva N. Y. Mr. Young will have charge of the business affairs of the company.

Howard & Morse, of 45 Fulton street, N. Y., manufacturers of Blackman fans, sustained a small loss by fire at their Brooklyn factory. The fire will not interfere in any way, however, with the execution of orders on hand.

The Globe Ventilating Co., Troy, N. Y., send us a little circular giving some strong testimonials as to the cooling influence of Globe ventilators on the attics and upper stories of houses. J. W. Gardiner, Lansingburgh, N. Y., writes to the company, telling them of an application of Globe ventilators for this purpose to his house which has given perfect satisfaction.

The Ellwood Iron Works, C. M. Converse, Western manager, 96 Lake street, Chicago, send us a neat blotter advertizing the new Ellwood radiator, which is made in all sizes, for steam and water, with splendid joint, smooth castings, artistic appearance and unobstructed circulation. They also send us a handsome wall calendar showing a partial view of an office heated by the Ellwood radiator. These calendars and blotters can be had by the trade on application.

A. A. Cryer & Co., 85 Centre street, New York, are installing two large Richmond sectional heaters in the store of Thos. Kelly, Fulton street, Brooklyn, N. Y.; two in the Sheridan apartment houses, Nostrand avenue, Brooklyn; two Richmond sectional hot water heaters in the Convent of the Immaculate Conception, 150th street and Melrose avenue, New York city; a No. 50 Richmond Victor steam heater in the house of "Uncle Gus Ricard," New York's old-time fire chief, at Erastina, S. I., and a 55 Richmond Victor in the house of August Kunkle, East New York.

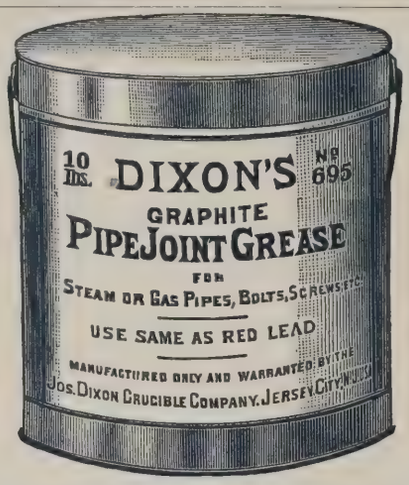
From a Printed Circular sent us by the University of the State of Missouri, Columbia, Mo., it appears that the university has received from the State since Feburary, 1891, by direct appropriation and in interest on its endowment, the sum of $1,525,000, and that the endowment, value of buildings, grounds, etc., amount to $2,200,000. The university has departments of language (classical, oriental and modern), science, history, economics, philosophy and pedagogics, and also of law, medicine, engineering (civil, electrical, mechanical and mining), agriculture, horticulture, veterinary science and mechanic arts. All of the departments are open to women. The cost of board is small; the fees moderate; the locality heathful; the climate bracing. For further information and catalogue address J. W. Monser, librarian, Columbia, Mo.

Hendricks' Architects' and Builders' Guide and Contracrors' Directory of America for 1894, published by the S. E. Hendricks Co., New York, a copy of which has been sent us by the publishers for review, is an invaluable reference book for any one who is in any way connected with building, considering that it is a complete directory of all the construction industries of the country, containing over 170,000 names, addresses and business classifications, comprising builders and contractors of material and construction in the building and kindred industries, with full lists of the manufacturers of and dealers in everything employed in the manufacture of material and apparatus used in these industries, from the raw material to the manufactured article. The book is well bound, and the price is $5.

The Bart. Ryan Heating, Ventilating & Plumbing Co has been incorporated at Chicago, Ill., with a capital stock of $20,000. Bartlett Ryan, 100 Washington street, Cornelius Ryan and Chas. Smith.

Richmond Heaters are going into the residences of Wm. Sickman, Torrington, Conn.; W. K. Leitch, Lowell, Mass.; Hon Geo. Nichols, Northfield, Vt.; H. C. Bliss, Attleboro, Mass.; J. F. Eldridge, Orleans, Mass.; B. C. Leonard, Boston, Mass., and into the printing office of H. Parker, Lowell, Mass.; St. Stephen's parish, Dodgeville, Mass., and Odd Fellows' Hall, Norwalk, Conn.

(*Continued on page xvii.*)



FAR BETTER AND CHEAPER THAN RED LEAD

Makes a tighter joint than red lead, that can be opened with perfect ease many years after.

Invaluable for all steam, gas and water piping, and equally useful for smearing gaskets on flange joints of meters, traps, and for bolts, screws, etc.

JOS. DIXON CRUCIBLE CO.,
JERSEY CITY, N. J.

BURRELLE, ON DEY ST.,

ISSUES

"POINTERS"

OR

"ADVANCE NEWS"

For Contractors and Supply Houses, covering all lines of construction.

FOR PARTICULARS ADDRESS

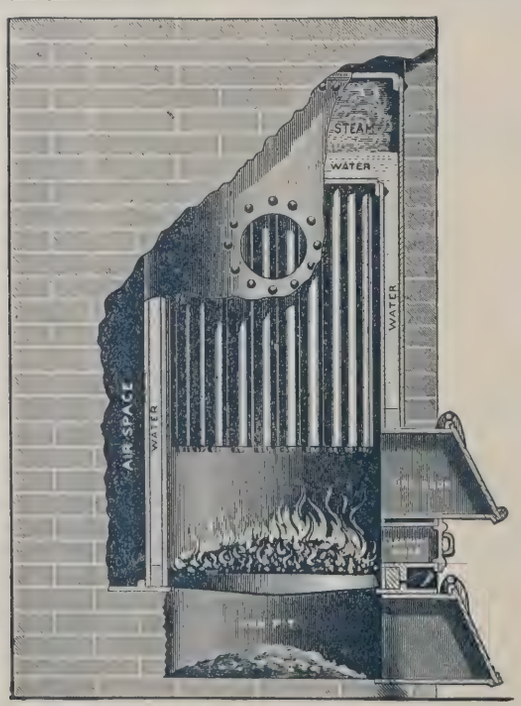
FRANK A. BURRELLE, Prest.,

151 Western Union Building

(8 DEY STREET),

NEW YORK.

THE REMINGTON WROT IRON STEAM HEATER.



For ECONOMY OF FUEL, ABSOLUTE SAFETY, GREAT DURABILITY, SIMPLICITY AND EASE OF MANAGEMENT,

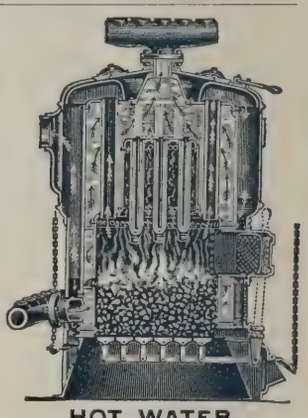
The Remington Wrot Iron Steam Heate CANNOT BE EXCELLED.

Built only by

Remington Machine Company,
WILMINGTON, DEL.

The SUN

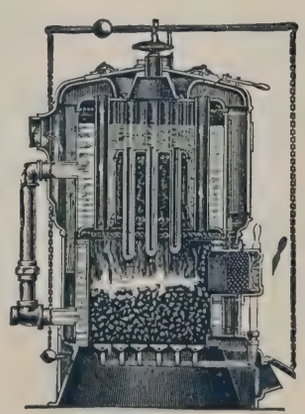
was idolized among the early races because of its Light and Heat. The fitter of this day praises the **Sun** boiler because it does all that is claimed for it and consequently is a money maker.



HOT WATER.

The points about the "Sun" are that it is made for steam or hot water—from carefully selected steel plate and iron. The surfaces divided up so as to give the best practical results.

Positive circulation. Perfect combustion. Economy and steadiness of heat.



STEAM.

SEND FOR NEW DESCRIPTIVE CATALOGUE.

The Raymond & Campbell Mfg. Co.

General Office,
MIDDLETOWN, PA.

244 Water Street, New York.

W. F. Wolfe, formery vice-president, has been elected president of the Fuller & Warren Warming and Ventilating Co. G. G. Wolfe has resigned from the vice-pesidency of the Fuller & Warren Co., of Troy. Several offers have been refused by him, and his future connections are as yet undecided.

Agents of Hart & Crouse, of Utica, N.Y., have closed contracts for Royal heaters as follows: The new almshouse, Middlebury, N. Y.; The Church of the United Brethren, Fort Wayne, Ind.; The St. George P. E. Church, Flushing, N. Y., and two large steam boilers will be used at the Tressler Home at Layesville, Pa.

The Description of the standard furnaces manufacured by Giblin & Co., Uica, N. Y., which appeared in our last issue, is, we regret to say, somewhat misleading, owing to mistakes of our printer. Fig. 1 and its accompanying description is all right, but the furnace shown by Fig. 2 is not the Standard air blast furnace described, being a picture of the regular Standard furnace, to which the description does not apply. It will be noticed that the third cut is also marked Fig. 2 instead of Fig. 3, which was the fault of the printer. The Standard combination heater shown by the third cut is made by applying a hot water attachment to the regular standard furnace, and not to the Standard air blast furnace, as stated. Such statements in connection with a well-known line of furnaces are to be regretted, and it is hoped that this correction will serve to clear up anything which may not have been understood.

From the Colliery Engineer Co., Scranton Pa., we have received circulars of information regarding the Correspondence School of Mechanics and Industrial Sciences and of the Correspondence School of Mines of which they are proprietors. These circulars give detailed information of the courses of study and methods of teaching, expense of scholarships, etc.; also testimonials, etc., of students who have pursued courses of studies under their instruction. An examination of the sample copies of their instruction and examination papers shows that they are carefully prepared and well adapted for the purpose which they serve. The work that has been and is being done in this school has attracted wide attention, and Mr. T. J. Foster, the manager, advises us that they have been visited by representatives of many of the leading mechanical and mining papers, who have, after careful examination of the methods pursued, universally commended them. In the instruction papers sent out the methods of teaching mechanical drawing are particularly interesting, and commend the work of this institution to all desirous of advancing our mechanics to better positions than their early opportunities or their present surroundings afford.

Mr. Foster writes us as follows: "All our students who apply themselves to their work are fully satisfied with the courses of instruction and the attention they receive from the instructors, and recommend the school to their friends.

"When an intending student is so situated as to be able to take a course of instruction in a regular school, we advise him to do so, as we do not claim to fill the place of the regular colleges and technical schools. Our method is adapted to the requirements of the large class of uneducated practical men whom the regular school cannot reach; those who either would not study or did not have the opportunity to study when young, and who, now that they cannot quit work to attend school, are willing to do the next best thing, i.e., study at home in their leisure hours.

"To every man who enrolls we guarantee instruction until he is proficient in the subjects included in his scholarship, no matter how long it may take, and we turn away no applicants who can read and write. With this preparation we can teach arithmetic, which is the first subject in each of the courses. After a man has learned arithmetic, and in learning it has formed habits of study, we can teach him the other methods of mathematics and the sciences. It is necessary for a student to make sacrifices and apply himself earnestly to his work to learn by our method, but many of them who do make surprising progress under correspondence instruction. You will notice, in looking over our circulars, that in some particulars we claim advantages for it over other methods of teaching.

"Our instruction papers are written by our instructors, and we endeavor to adapt them, as far as possible, to the requirements of working men who have not had educational advantages."

The Roe-Stephens Mfg. Co., of Detroit, Mich., say it pays well to make reliable goods. While other companies have been idle, this company have been continuously at work, filling orders for their well-known specialties.

A New Departure in catalogues has been issued by the Richmond Stove Co., of Norwch, Conn., for Henry W. Peabody & Co., export agents, New York, London and Australia, which will no doubt be productive of many sales for the company in foreign countries.

WANTED.

Announcements in this department will be inserted at the uniform rate of twenty-five cents per line. For five or more insertions of the same advertisement we make a discount of 10 per cent. Calculate on nine words to a line.

WANTED.—A competent Heating and Ventilating Engineer. Address, stating experience, locality of former service, references and other information with a view to permanent engagement, P. O. Box 284, Worcester, Mass.

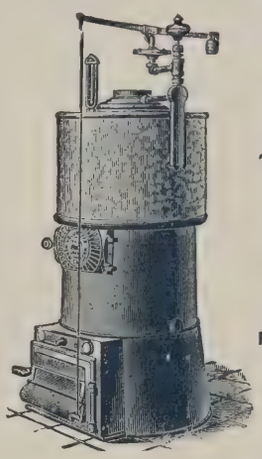
GOOD Machinist and Draughtsman, two years experience superintending the erection of fan and steam systems of heating, familiar with laying out all fan work, wants situation.
Address, "Fan," H. & V. Pub. Co.

WOOD AND IRON
PATTERNS,
HOT WATER AND STEAM BOILERS,
Originated and perfected at moderate cost of work with no bonus for invention at
VEDDER PATTERN WORKS,
H. CLAY BASCOM, Prop. TROY, N. Y.

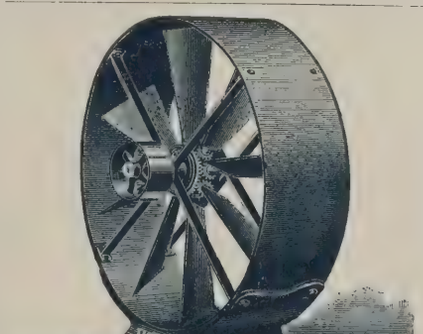
J. S. & M. Peckham Co., of Utica, N. Y., send us their latest illustrated catalogue for the fall of 1894. It shows a new and improved assortment of first-class modern stoves and ranges for which discounts will be quoted on application, all former price lists being withdrawn.

(*Continued on page xviii.*)

WALL PAPER
60c. a Room. Embossed Golds 20c. (formerly $1.50). Samples mailed free. Fares to and from N. Y. City paid on reasonable purchases. BARGAIN HOUSE, 10 W. 23d St., N.Y

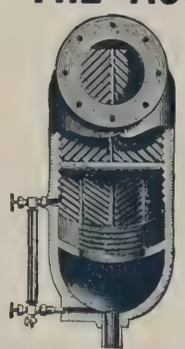


VOLUNTEER
AND
ALL RIGHT.
The Best and
ONLY
Self-regulating
Hot Water Heaters
on the market
FOR STEAM HEATING.
Manufactured by
The Wm. H. Page
Boiler Co.,
Norwich Conn

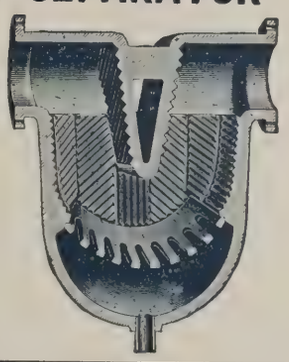


TUERK'S
CHANGEABLE BLADE VENTILATING FAN.
The best constructed Fan on the market, also the only one that the blades can be changed to deliver different quantities of air without changing speed. : :
Send for full description of Fan and prices before purchasing.
MANUFACTURED BY
TUERK WATER METER CO., Fulton, N.Y.

THE AUSTIN OIL AND WATER SEPARATOR
(PATENTED)
FOR
PURIFYING EXHAUST AND ELIMINATING CONDENSATION
FROM LIVE STEAM
IS INFINITELY SUPERIOR TO ALL OTHERS.



Guaranteed to separate oil from the exhaust of any type of engine. Sent to responsible parties on trial. Sold strictly on its merits. Circulars and prices on application.



AUSTIN SEPARATOR CO.
59 Woodbridge Street, West, DETROIT, MICH.

"COLUMBIA"
SEE WALL AND CEILING PLATE.
Those smaller spirals at the top?
They grip the pipe!
See those larger ones below?
They hold the plate and allow for expansion and contraction of the pipe!



Easily adjusted and inexpensive!
Made in all sizes.
Send for circular and prices.
Sample on application.
Ask your dealer for them or send to the manufacturers.

Once in place this plate always stays there! The tension of the spring keeps it!
The J. W. Chamberlain Co., Bangor, Me.

The Fuller & Warren Co., of Troy, N. Y., have closed three large heating contracts in Westminster, Md.

The Globe Ventilator Co., of Troy, N. Y., have placed two sixty-inch ventilators in the Powers House, Rochester N. Y., and are placing all the ventilators for the new works of the Johnson Co., at Loraine, O.

The New Queen Anne Residence lately built by Dr. C. B. Warner on the bluff overlooking Lake Champlain at Port Henry, N. Y., is to be heated by a No. 3 Standard steam boiler, manufactured by Giblin & Co., Utica, N. Y. Mr. M. Hogan, of Port Henry, is erecting the apparatus.

W. F. Greene, of Troy, N. Y., in addition to good sales in the heating line, is having many calls from steam pump manufactures for his zero valve wheel for use on underwriters and other classes of steam pumps. In addition to this valve wheel, Mr. Greene is the manufacturer of ornamental knobs and handles for steam and hot water boilers.

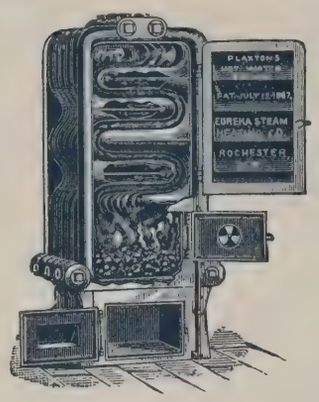
The Vedder Pattern Works, Troy, N. Y., H. Clay Bascom proprietor, in addition to manufacturing patterns for steam and hot water boilers, are making many radiator patterns for the trade. The company can point with pride to many successful inventions now in use by the trade, the patterns for which went through their hands. We believe we do the trade a favor in recommending Mr. Bascom to their favorable notice.

The Deane Steam Pump Co., Holyoke, Mass., and 72 Cortlandt street, New York, who had a most attractive exhibit at the last Master Steam Fitters' convention at the Broadway Central hotel, New York, have spared no trouble or expense to make the triplex power pump, described in our last issue, a complete and superior machine in every particular, and the makers are to be complimented on their success in being able to offer a pump that for utility, compactness and accessibility is second to none

Hart & Crouse of Utica, N. Y., are now ready with their large size Royal safety sectional steam heaters and their Royal hot water heaters. These new sizes run from 1,100 to 3,000 feet of radiation in steam, and from 2,000 to 5,000 feet in hot water. Several improvements have been made, on which patents have been secured. The new doors are very ornamental and have worked on them the company's name. To give an idea of the heater, we quote the largest: Size of heater, 62; number of sections, 12; square feet of direct radiation heater will supply 5,000; cubic feet of air space heater will heat with direct radiation and proper piping, 153,000; size of fire chamber 32 by 66 inches; square feet of surface in heater, 420; height of heater, including drum, 72 inches; length of heater, 90 inches; width of heater, including return manifolds, 60 inches; size of smoke pipe, 12 inches; size of flow opening, 7 inches; number and size of return opening, four of 4 inches; price, including asbestos covering, $1,100.

Alexander E. Schnee, Postal Telegraph Building, New York, general sales agent for the Pohle air lift pump, sends us a small pamphlet which describes the pump as consisting in the main of an air compressing apparatus and reservoir to contain the compressed air, two plain iron pipes one of which conveys compressed air into an enlarged, open-ended foot piece attached to the eduction pipe, and the foot pieces and connecting tubing to convey the compressed air and the water, thus making a complete whole. The working principle of the pump is explained by saying that as compressed air is admitted into the lower end of the water pipe it at first expels the incidental standing water in the pipe in one solid column; right after that it arranges itself automatically in alternate layers with the water in the pipe; the water outside the pipe acting as a head, flows into the discharge pipe by the force of gravity. The expansive energy stored in the compressed air layers, which form water-tight, piston-like bodies, lifts the water lying above them, to the outlet end. As each air section progresses towards the exit, it expands on its way in proportion as the overlying weight of water is diminished by expulsion, so that the air layer, when it reaches the top, has only one water layer overlying it, and this air, when it lifts up and out this overlying water layer, is of the same tension as the normal atmosphere, thus proving that the whole of its elastic energy is utilized in work.

In a Circular Letter to the heating trade, under date of August 1, the American Boiler Co., of Chicago, says: "Our notice has recently been called to the fact that some makers of hot water heaters are employing all the wit they possess to put on the market heaters that have a similar external appearance to the original genuine Spence, which we own and control, and are sending out jaunty letters as a disguise. We most emphatically say our company own and control all the original United States patents, covering the most essential features in the internal construction of the genuine Spence boilers pertaining to the water post, which makes each section independent of the other. In no other boiler manufactured and sold we know of, is this possible. We shall not try to deceive any of the trade by overrating any of the large line of boilers we manufacture and sell, as we are working strictly upon the basis of maintaining the already established reputation we enjoy. We are not merely doing business to-day, but expect to continue in the market for a good many years. If you accept the desultory letters sent out by new beginners, you must take your chances on results, as it takes years of experience to overcome certain inherent defects in the construction of an article like water boilers. After a long experience of twenty-five years, during which time we have seen a great many manufacturers of boilers pass into a state of "innocuous desuetude," it prompts us to know we shall continue to stand pre-eminently at the head of the list, and want to merit a continuance of your kind patronage and confidence. Don't hesitate to write us regarding any deails in connection with steam or hot water heating, as it is a great pleasure for us to co-operate with you to our mutual advantage."



PLAXTON HOT WATER HEATER

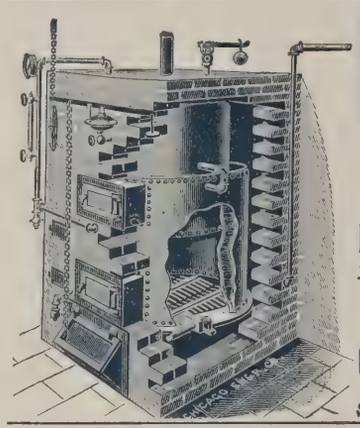
Excels all other Heaters in respect to

SIMPLICITY OF CONSTRUCTION.
ECONOMY OF FUEL.
EASE OF CLEANING.

The Cheapest Heater on the market when results are considered.

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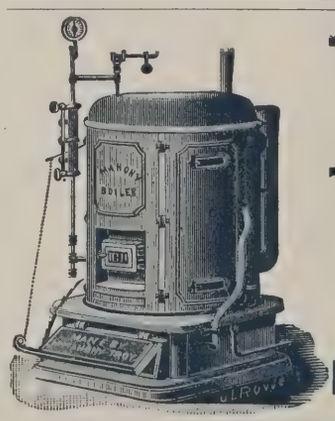
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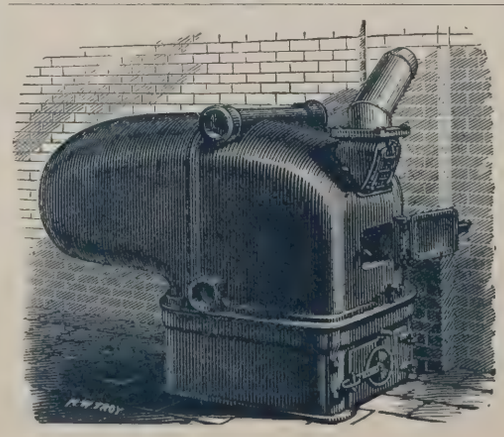
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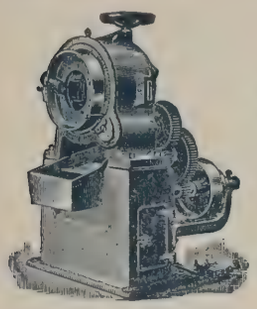
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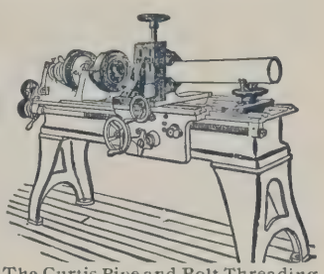
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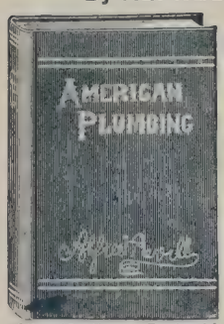
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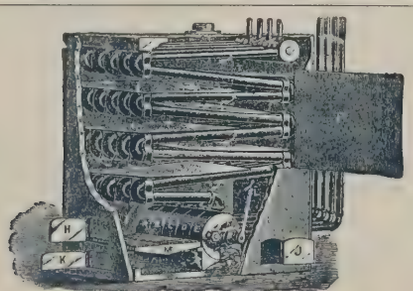
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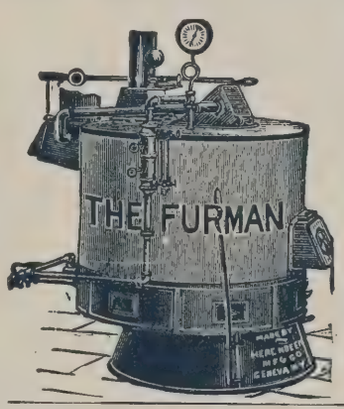
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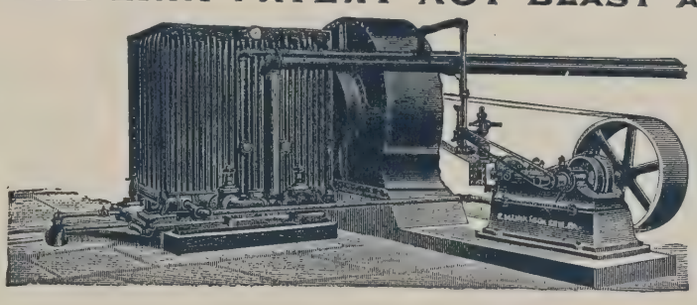
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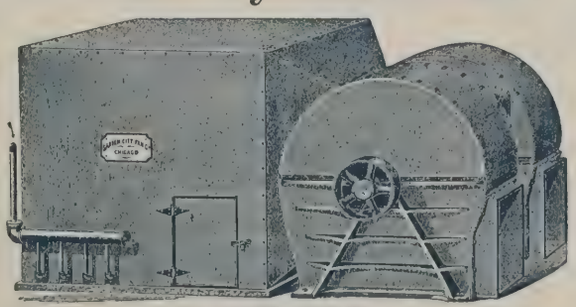
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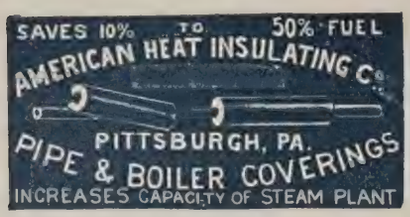
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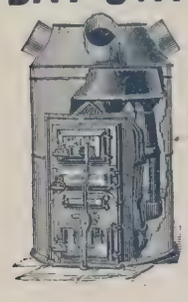


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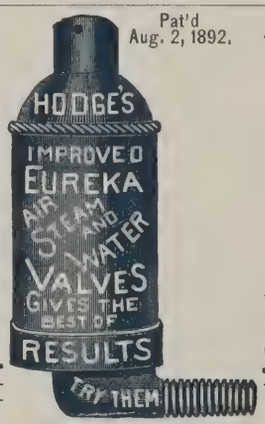
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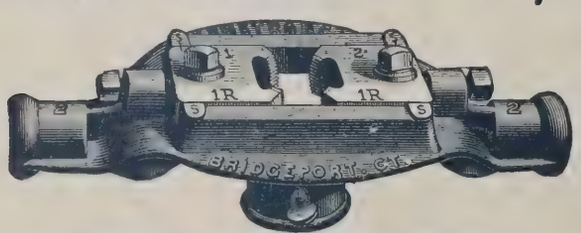
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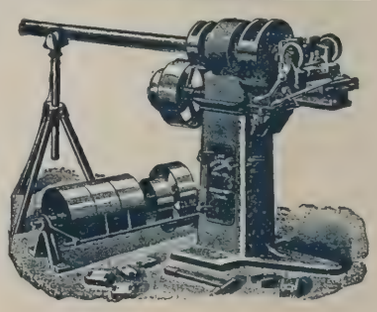
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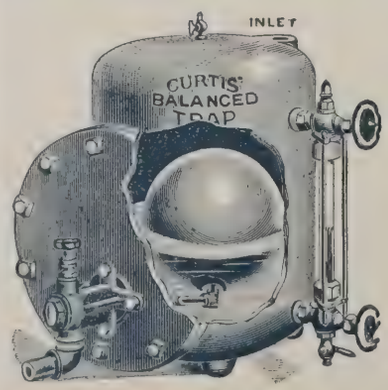
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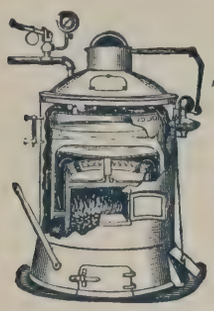
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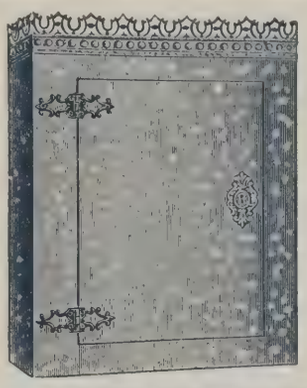
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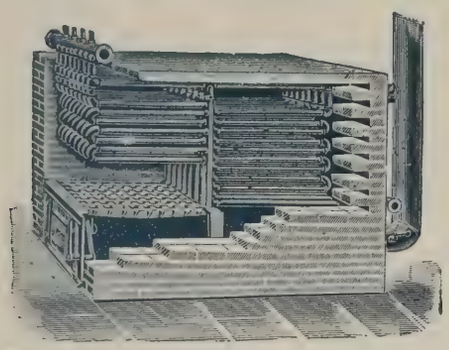
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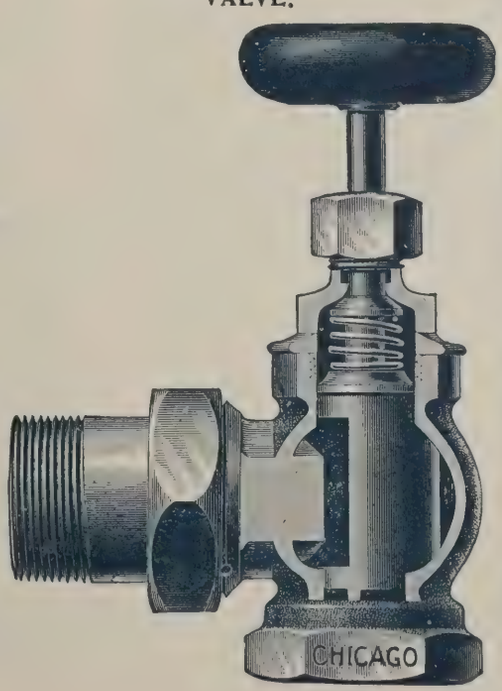
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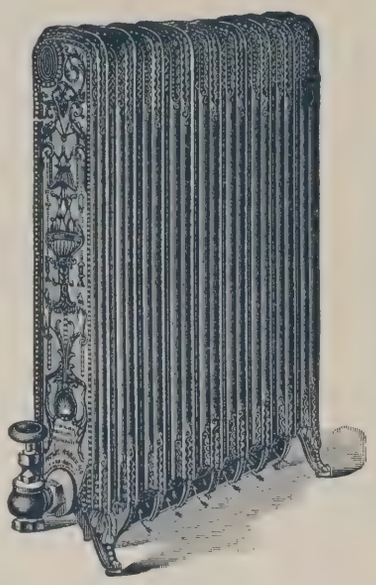
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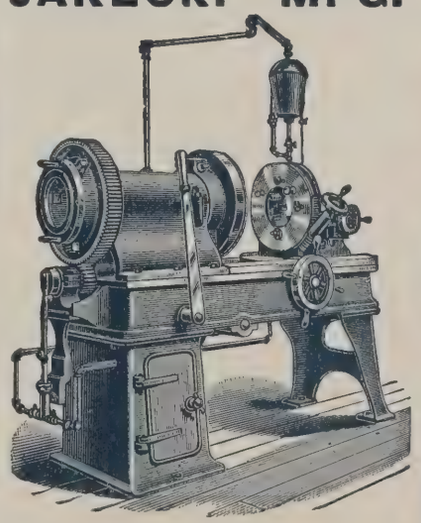
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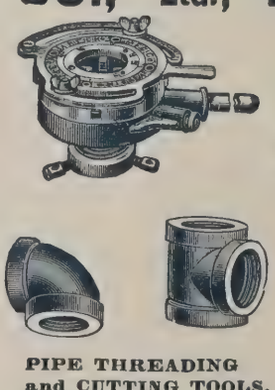


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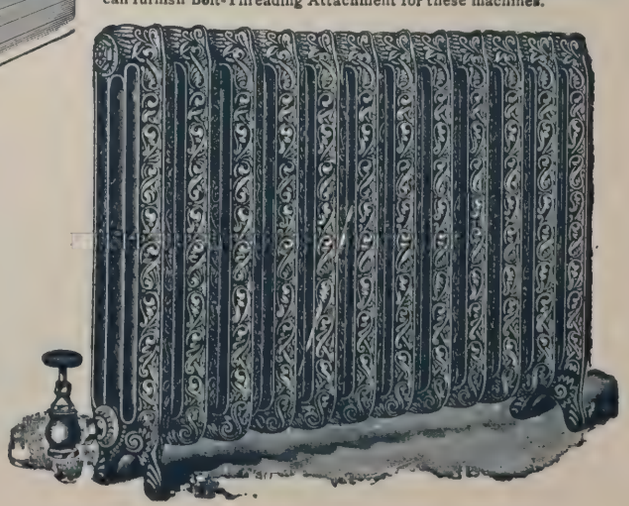
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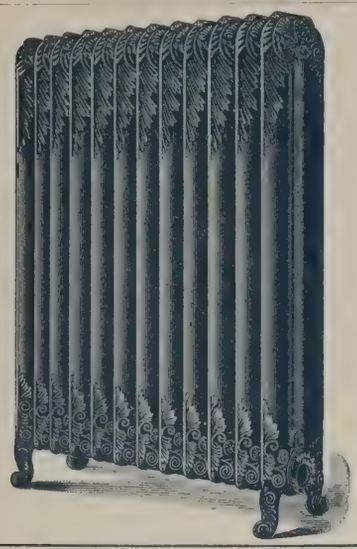
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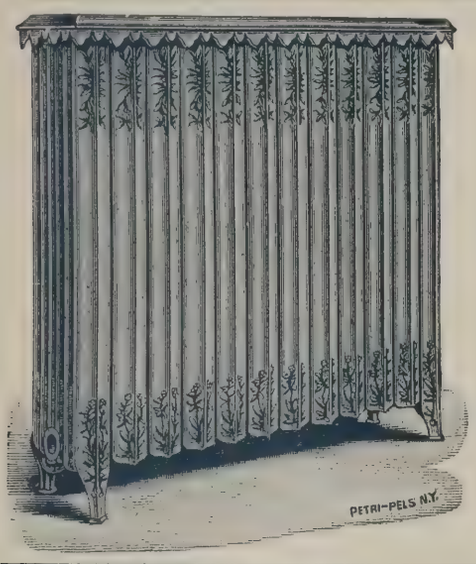
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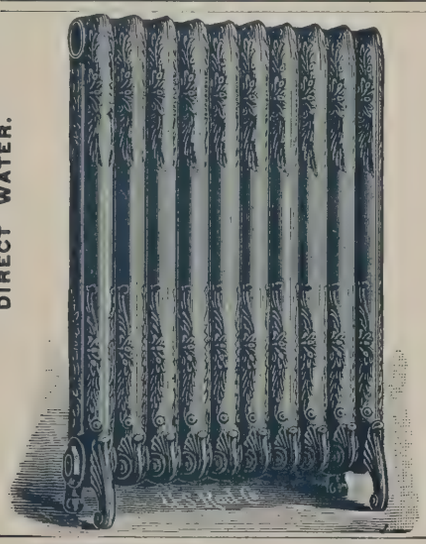
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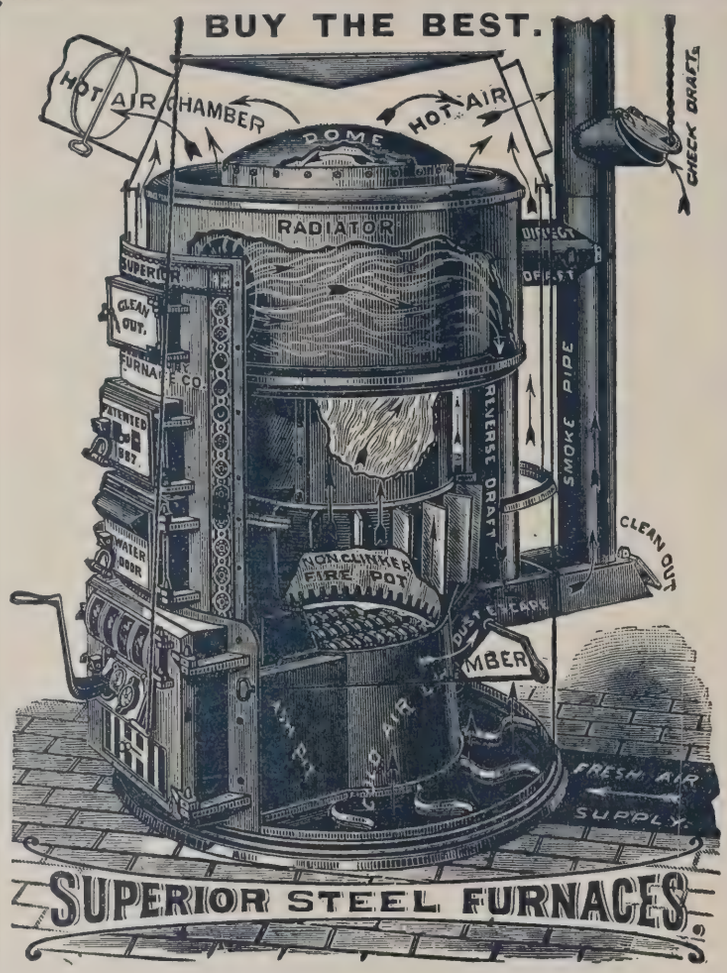
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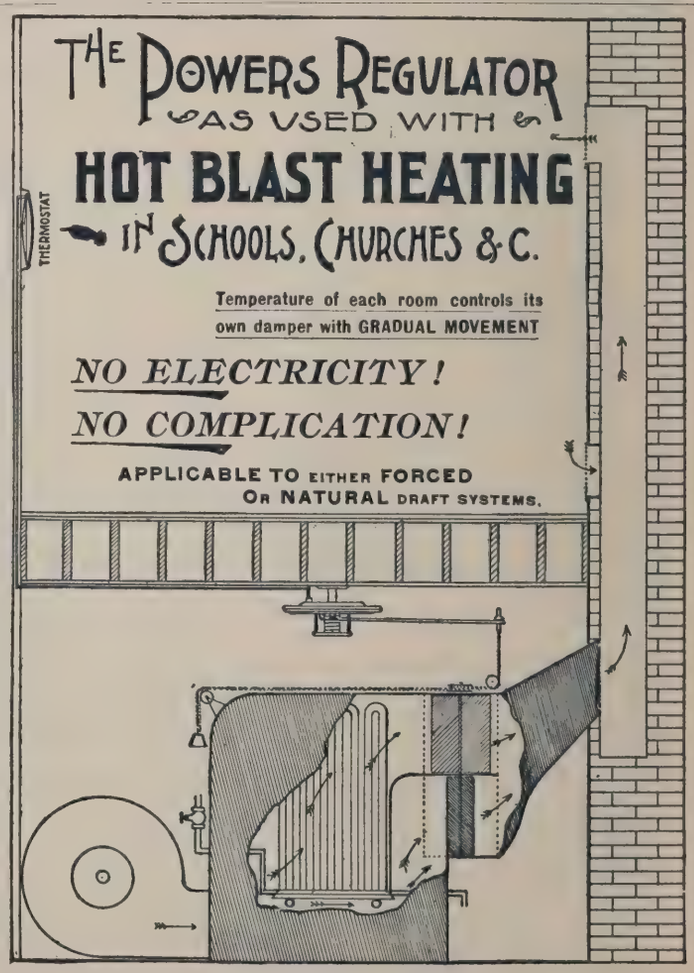
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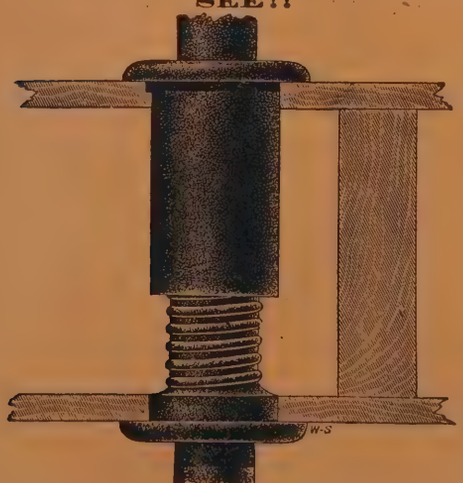




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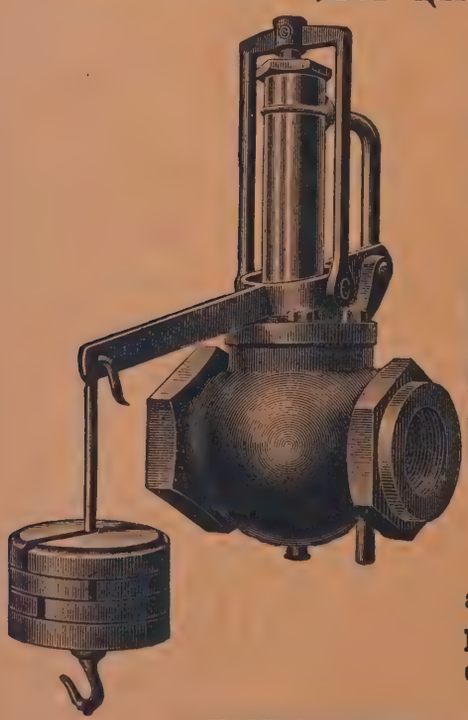
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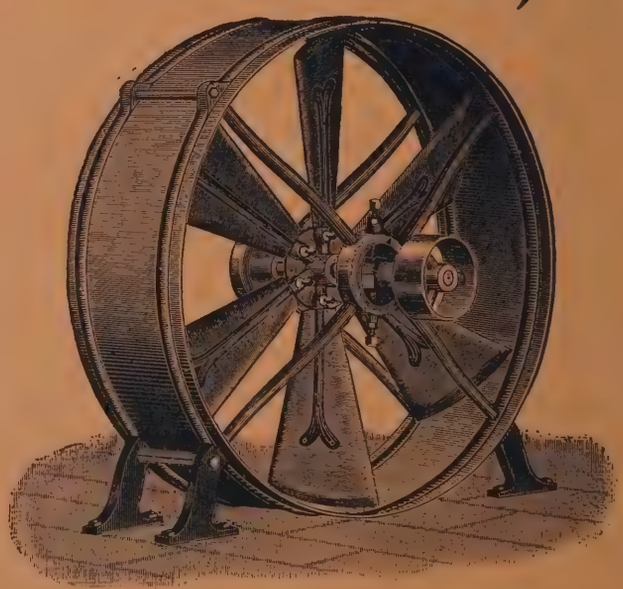
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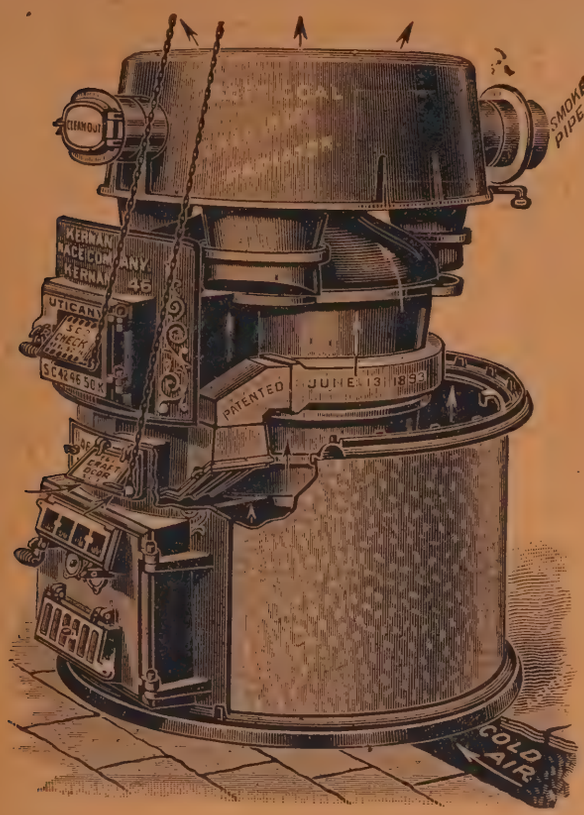
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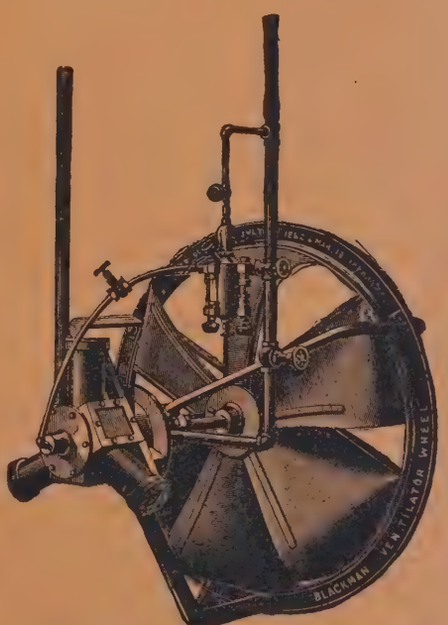
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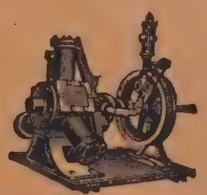
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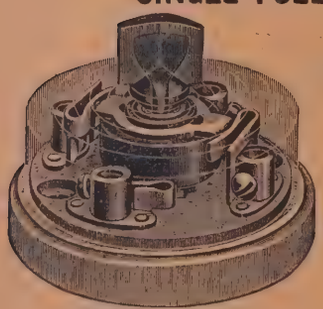
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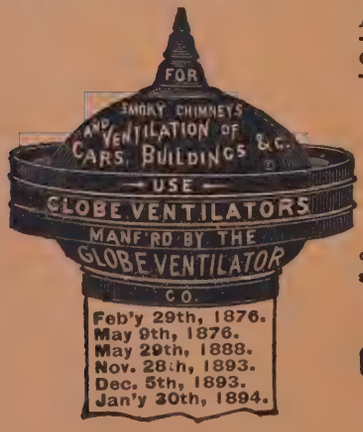
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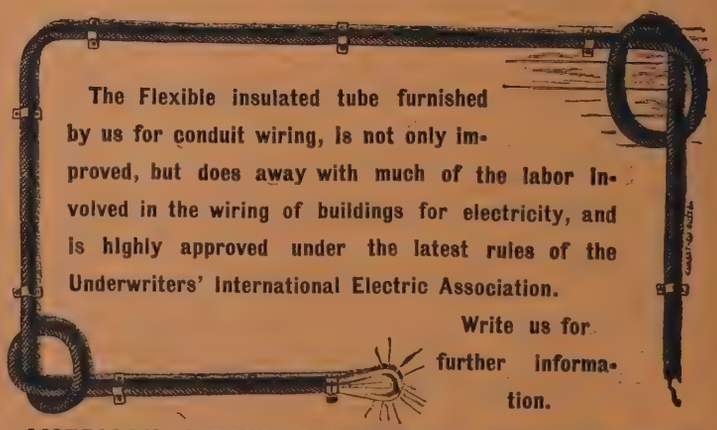
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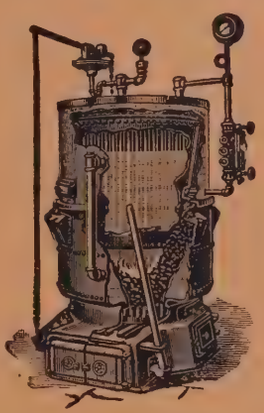
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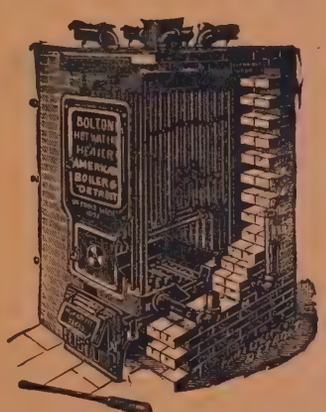
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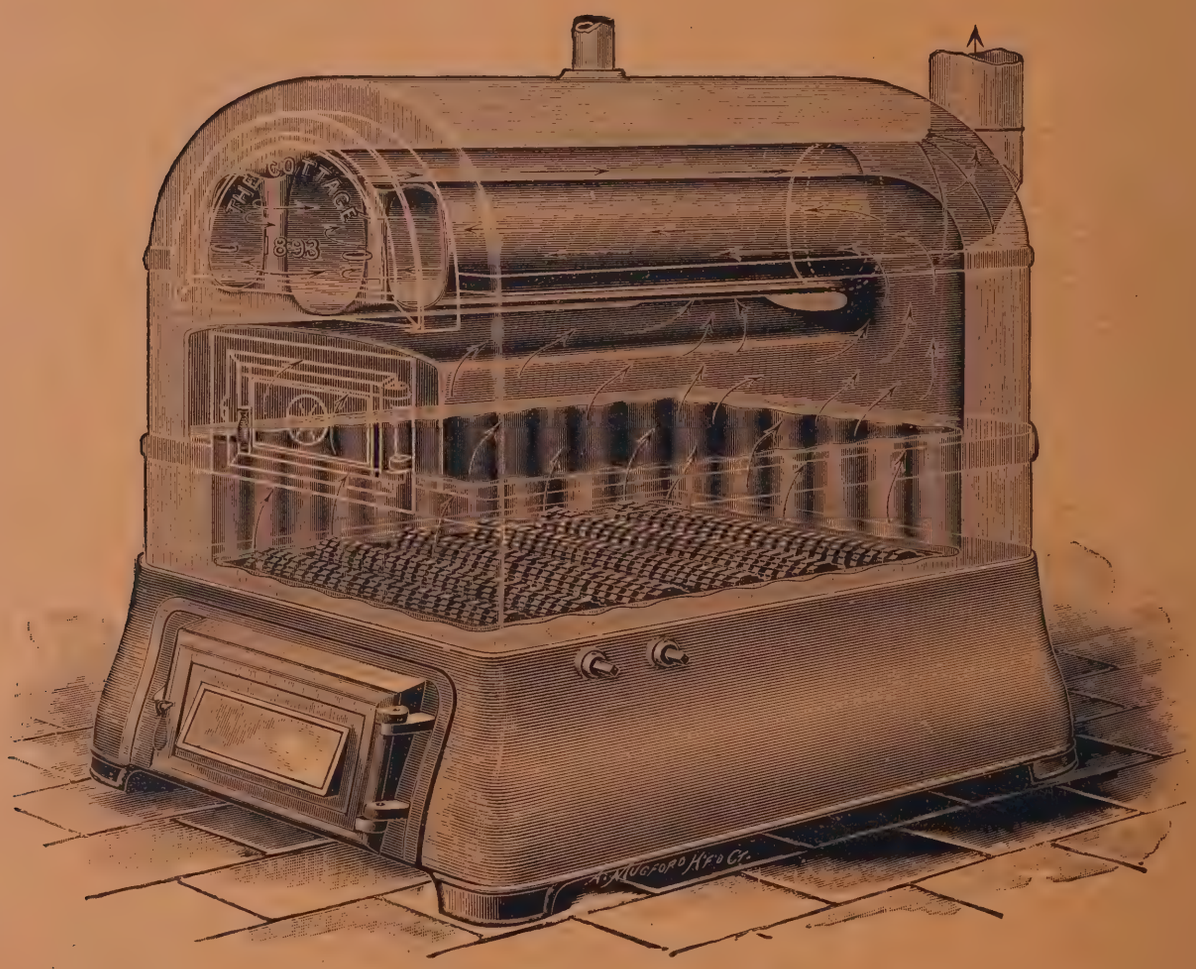
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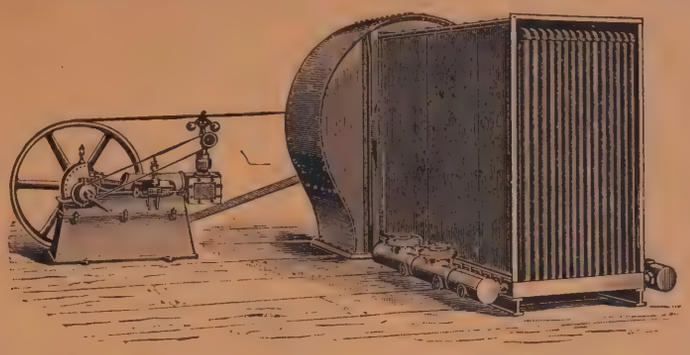
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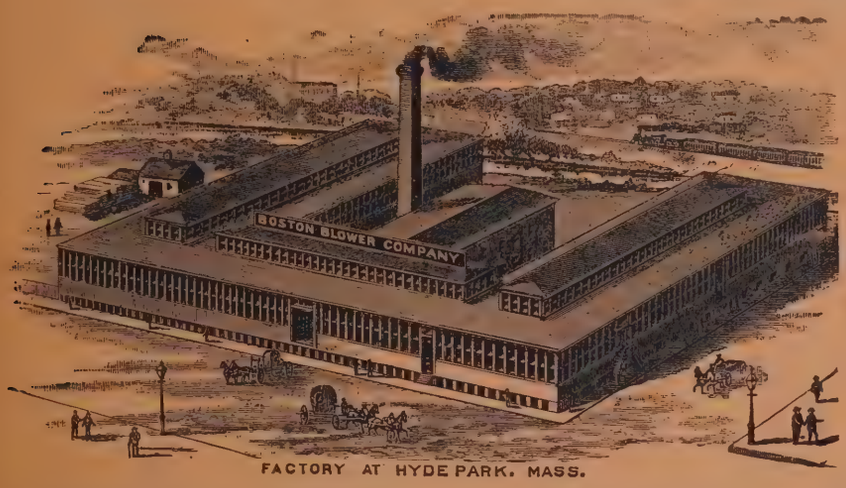
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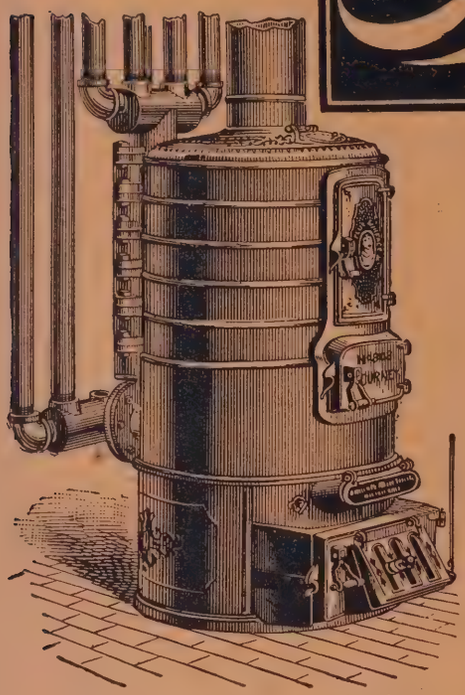


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Complete Lines
For all
Requirements.

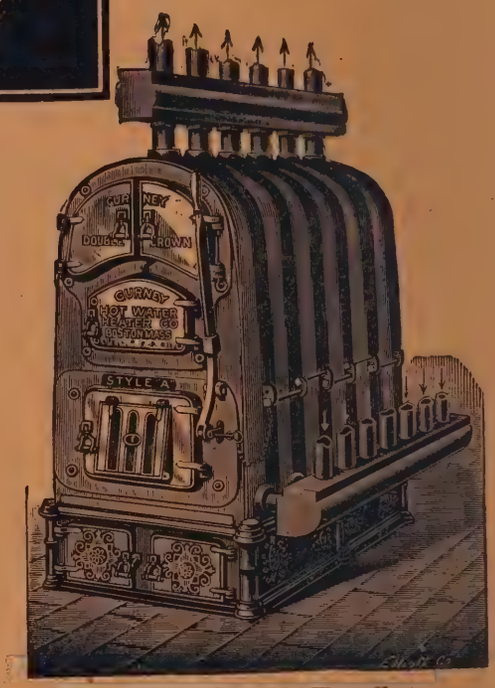
Gurney

Sold only to the Trade.



Gurney Hot Water Heater.—300 Series.

HOT WATER HEATERS, STEAM BOILERS, RADIATORS.



Gurney Double Crown Hot Water Heater.

∴ THE STANDARD FOR EXCELLENCE. ∴



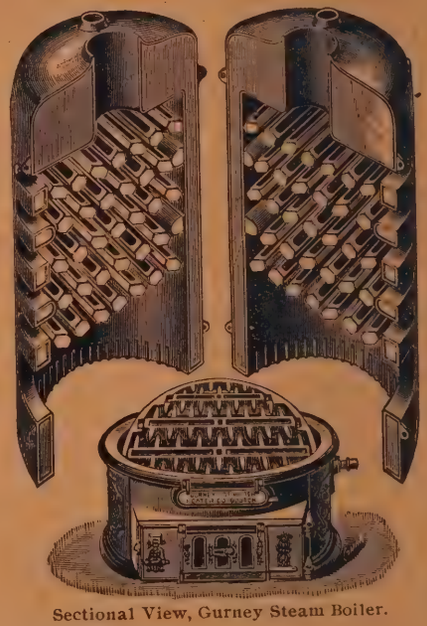
Perspective View, Gurney Steam Boiler.

What W. J. Baldwin, M.E., New York's leading Engineer says of the test of the Steam Boiler:

"The performance of the Boiler during the trial was admirable, being steady and reliable, so that the steam did not vary ½ lb. in pressure at time of firing."

and he further states:

"I never tested a boiler that gave as high an efficiency of evaporation per square foot of average boiler surface."



Sectional View, Gurney Steam Boiler.

• • ALWAYS LEADING BY THEIR MANY MERITS. • •



Gurney Radiator for Hot Water.

We invite your Inspection and Correspondence.

SEND FOR TRADE CATALOGUES.

Gurney Heater Mfg. Co.

163 Franklin St., cor. Congress,
BOSTON, MASS.

Selling Agencies:

JOHNSON & CO., 71 John St., N. Y., and Vicinity.
J. C. F. TRACHSEL, 330 Arch St., Phila., and Vicinity.
A. A. GRIFFING IRON CO., 34 Dearborn St., Chicago, Ill., and Western States.



Yale Quintette Radiator for Hot Water or Steam.

A Combination.





The Most Perfect Construction.

The Handsomest Designs.

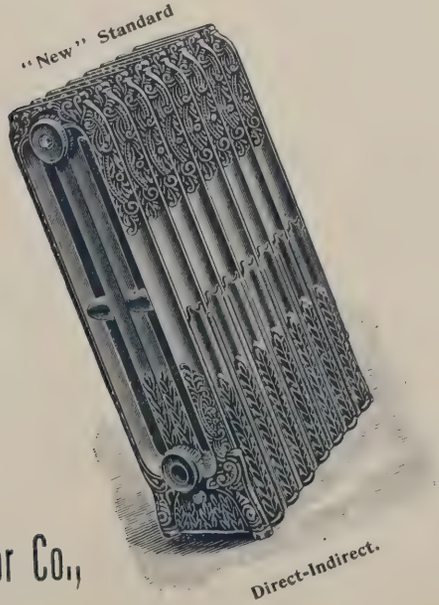
The Smoothest Castings.

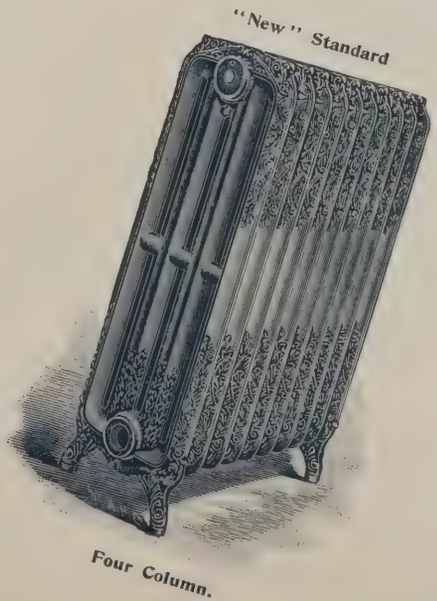
The Unequalled Efficiency of our New Standard Radiators form a combination that beats all others.

Steam,
Water,
Direct,
Indirect,
Direct-Indirect

NEW YORK. CHICAGO.
Standard Radiators
BUFFALO. BOSTON.

All our Steam Radiators are connected top and bottom, same as our Water Radiators, giving the quickest and most positive circulation.





The Standard Radiator Co.,

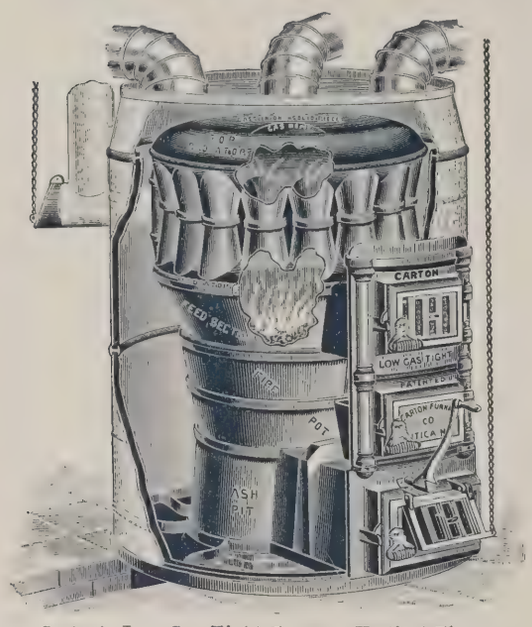
Works and General Offices,

Buffalo, N. Y.

Carton

Hot Water & Steam Boilers & Furnaces.

SOLD ON THEIR MERITS FOR 47 YEARS.



Carton's Low Gas Tight Furnace, Vertical Flues. All Cast Iron.

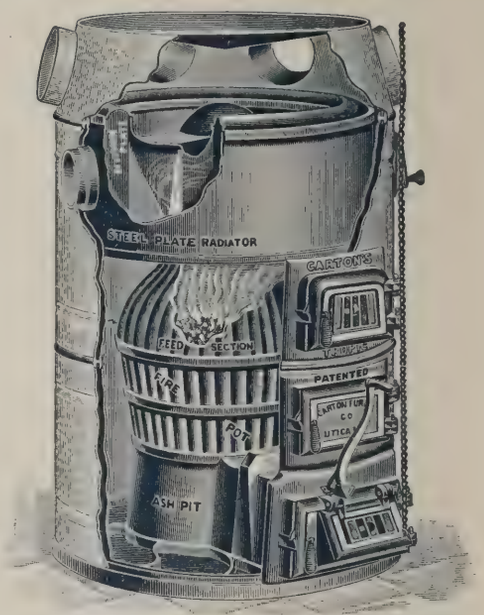
All our Heaters are Guaranteed.

.....

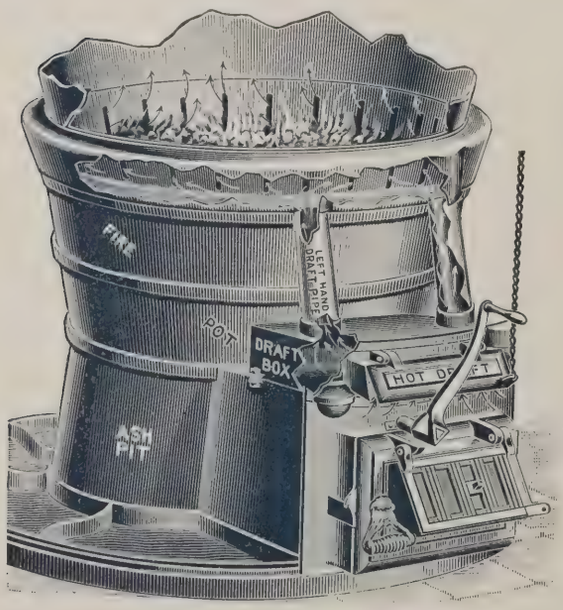
The Largest Variety of Styles and Sizes.

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They are easily Sold. Many Thousands in Use.



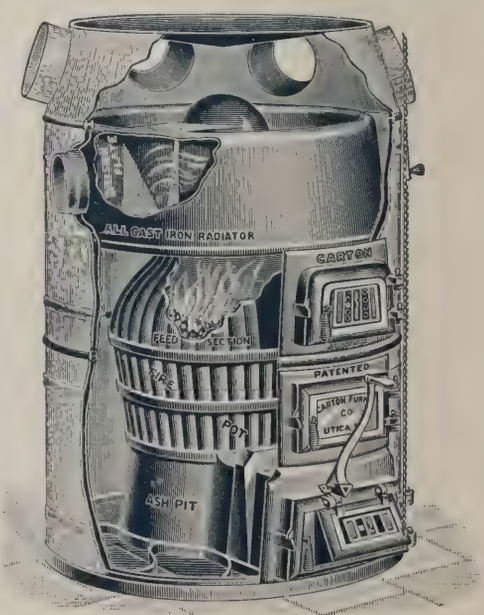
Carton's Tropic Furnace with Return Flue, Steel Radiator.



Carton's Smoke Consumer Furnace. Vertical Self Cleaning Flues.

They build up a reputation for the dealers who sell them, because they always give satisfaction.

The original "Smyth" Triangular Revolving Anti-Clinker Grates used in all our Heaters. Perfect in Operation.



Carton's Junior Furnace with Return Flue, all Cast Iron, Radiator.

- - - Manufactured by - - -

CARTON FURNACE CO., Utica, N. Y.

Makers of Heating Apparatus for the past 47 years.

Write for our Catalogue and Discounts and secure the Agency. Also write for our Price-List on our Superior line of Furnace and Pipe Fittings.

WESTERN BRANCH:

Nos. 83 and 85 Wabash Ave., Chicago, Ill.

Sold on their Merits

ROYAL HEATERS

and not on their Antiquity.

TWENTY-FIVE YEARS in the Steam and Hot Water Heating Business enables us to give you the longest experience and the best possible advice.

Realizing that this is an age of progression, and that there was an opportunity for improvement in the construction of Steam and Water Heaters as well as in other lines, we constructed the "ROYAL" Steam and Hot Water Heaters, based on a knowledge of the requirements gained in a quarter of a century of successful practical experience.

The "ROYAL" Heaters were first presented to the public in 1892, being **"sold on their merits and not on their antiquity."**

The "ROYAL" Heaters have been placed in all sections of the country, from Maine to Oregon, by some of the leading Fitters.

There are hundreds of the "ROYAL" Heaters in use, and the results and economy of fuel which they have shown fully demonstrates that their principle of construction is the correct one.

The "ROYAL" Heaters being made in our own works, enables us to furnish the best goods at the lowest prices. The intelligent Fitter purchases from the manufacturer and not from the jobber, saving the middleman's profit.

The "ROYAL" Heaters are so thoroughly constructed that the question of repairs is a very small part of our business; but having our own works and patterns, we are always in a position to furnish repairs, promptly, for any goods we have ever made.

Men who consult their own interests will not purchase goods from companies who only exist on paper and whose goods are made in outside foundries, of such materials as the foundryman cares to make them of to insure his profit, when they can purchase direct from the manufacturer who has a reputation to maintain.

Write for catalogues, price lists and discounts.

We manufacture the largest and most successful line of Sectional Steam and Hot Water Heaters in America.

HART & CROUSE,

Manufacturers of "ROYAL" HEATERS,

79 LAKE ST., CHICAGO, ILL. 78 FAYETTE ST., UTICA, N. Y.

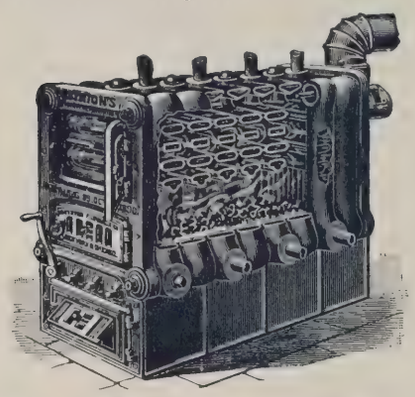
211 WATER ST., NEW YORK.

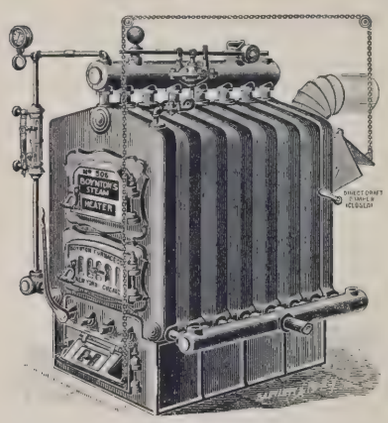
W. M. MACKAY, Manager Steam and Hot Water Department.

ESTABLISHED 1849. GOODS UP TO THE TIMES. INCORPORATED 1884.

THE BOYNTON FURNACE CO.

Are the only manufacturers of the Genuine and Latest Improved





BOYNTON

HOT WATER HEATERS
STEAM HEATERS
FURNACES
RANGES, ETC.

and all goods bearing that name fully warranted.

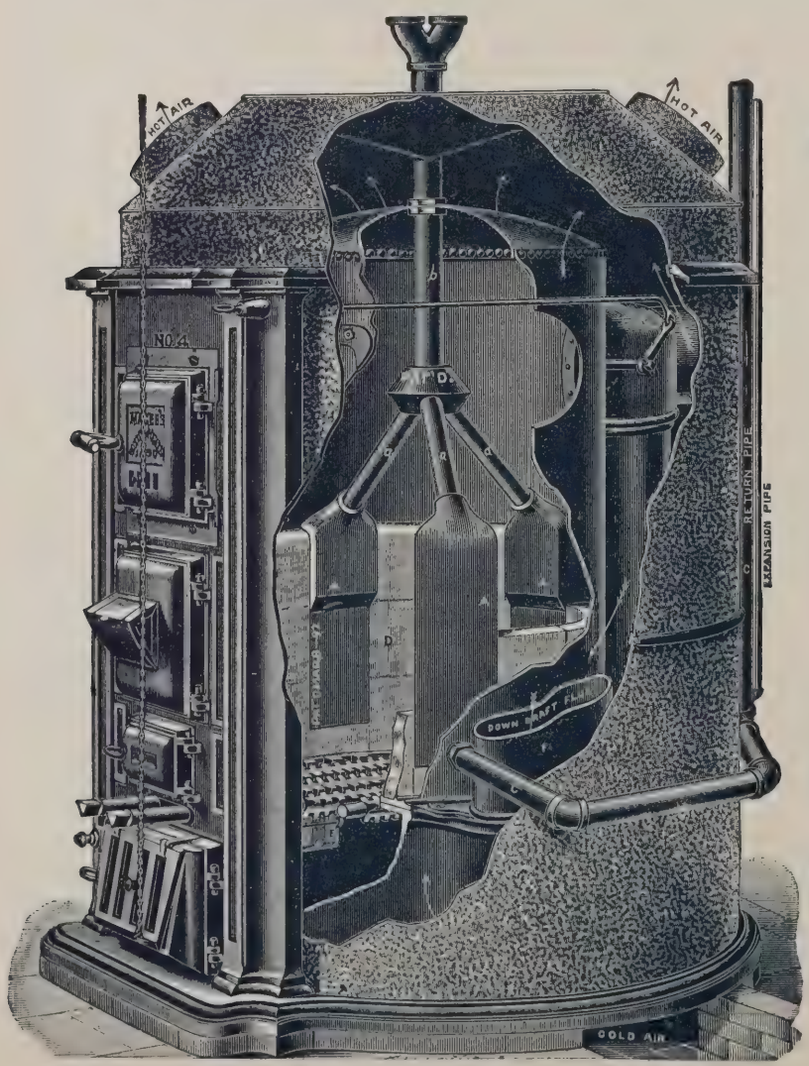
Make Sure that BOYNTON FURNACE CO. are the manufacturers of the heating apparatus you purchase. They are for sale by the best dealers all over the United States. Our catalogue free. Better send for it, indicating the style of heating desired.

THE BOYNTON FURNACE CO.

195 & 197 Lake St. CHICAGO.

207 & 209 Water St. NEW YORK.

NOTE.—The Boynton Furnace Co. manufacture Steam and Hot Water Heaters and Furnaces of special construction which are guaranteed to operate successfully with soft coal for fuel.



—THE—

MAGEE FURNACE CO.

is one of the oldest makers of

☼ FURNACES ☼

in the country. We have used combined ***hot water*** and ***warm air*** in heating for more than ***25 years.*** Our present system is the result of long experience, and is as near perfection in every particular as it is possible to attain.

Let us send you some of the letters we have received from enthusiastic users. It will pay ***YOU*** to control the sale of the ***MAGEE*** line in your town.

MAGEE FURNACE CO.

32-38 UNION STREET, BOSTON, MASS.

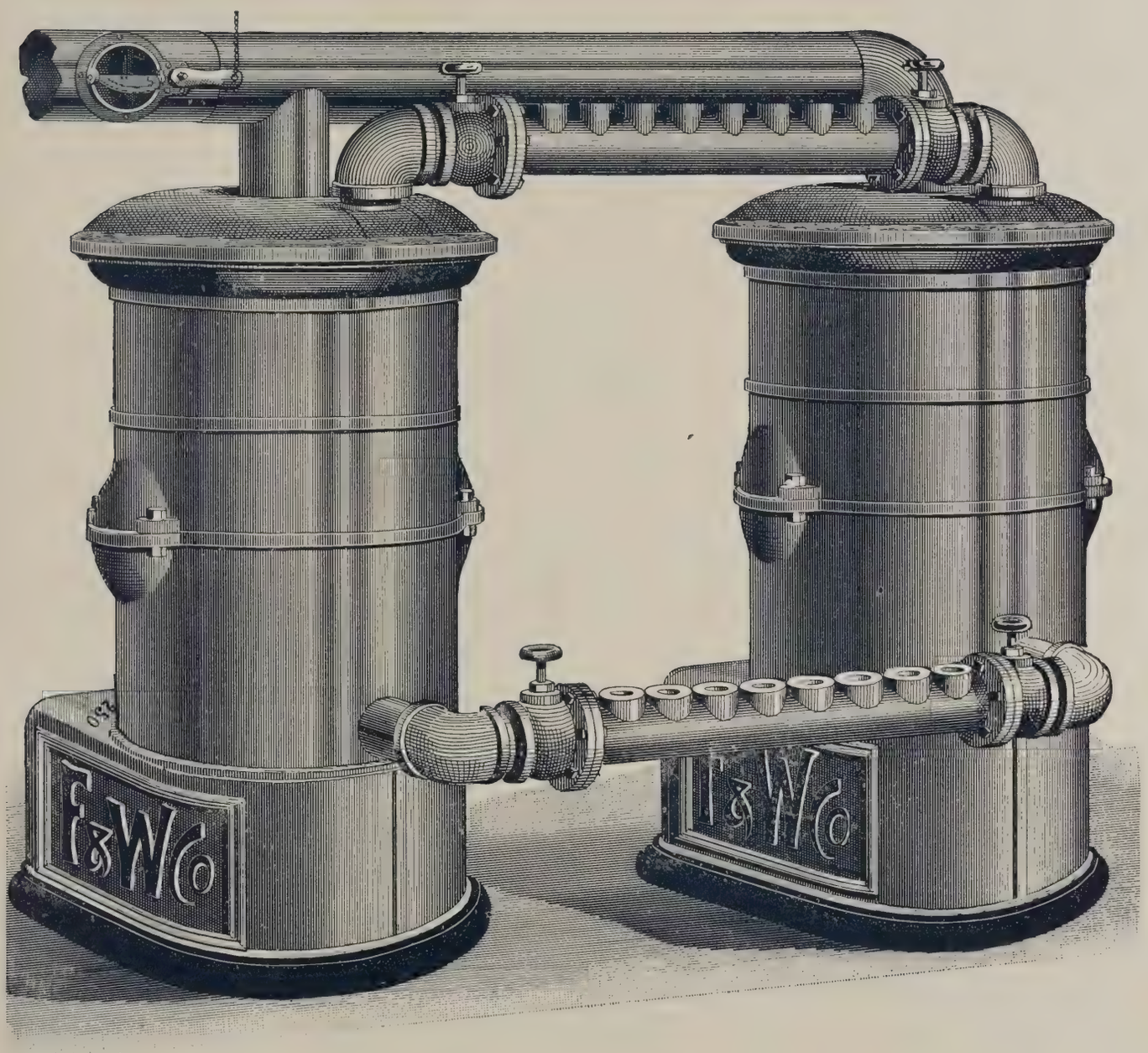
242 WATER STREET, NEW YORK.

86 LAKE STREET, CHICAGO, ILL.

F&W Co.

GUARANTEED

HOT-WATER HEATERS.



TWIN SYSTEM HOT WATER HEATERS.

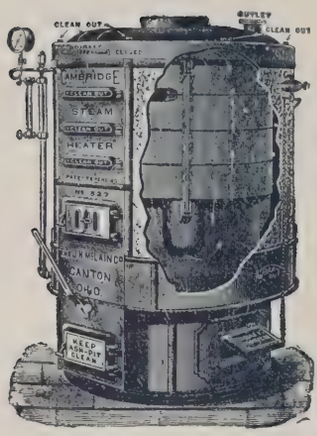
Giving great capacity during extreme cold, in milder weather one heater can alone be operated, thus economizing coal, and preventing overheating in mild weather.

FULLER & WARREN CO., TROY, N. Y.

CUT PRICES ON HEATERS

To compete with us, is what

Other Manufacturers have done. . . . . .



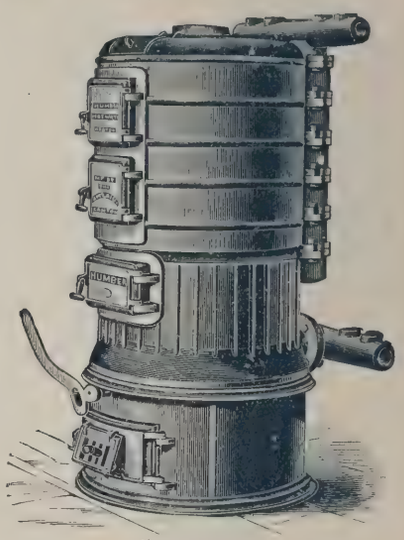
"CAMBRIDGE."

Evidence of . . .
Good Qualities of

"CANTON HEATERS."

Don't you think so?

You Can Still Save Money
By Dealing with Us. . . .



"HUMBER."

The J. H. McLAIN COMPANY,
CANTON, OHIO.

BOSTON:
191 Fort Hill Square.

DENVER:
1528 Champa Street.

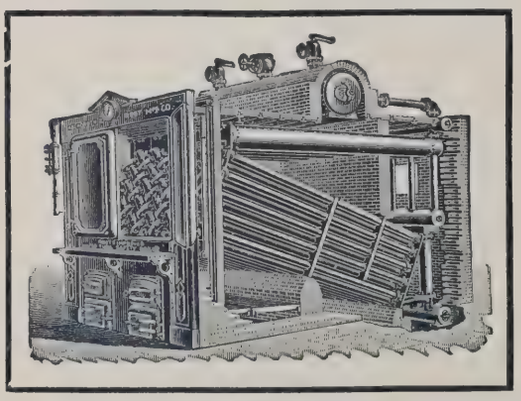
CANTON HEATERS
TRADE MARK.

CHICAGO:
88 Lake Street.

SAN FRANCISCO:
5 Crocker Building.

NEW YORK: 69 Centre Street.

THE ROOT IMPROVED WATER TUBE BOILER



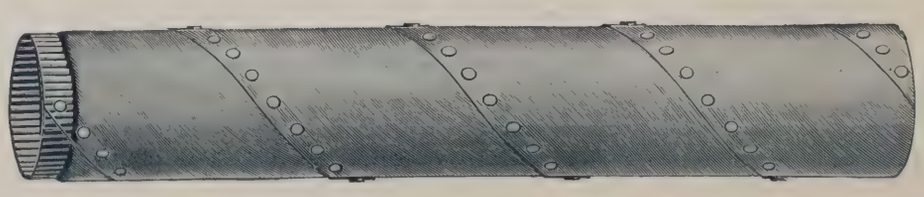
Rapid Steam Generators for Heating

APARTMENT HOUSES, OFFICE STRUCTURES,
. . . . Etc., Etc.

HIGHEST POSSIBLE ECONOMY WITH ABSOLUTE SAFETY.

SPIRAL RIVETED PIPE.

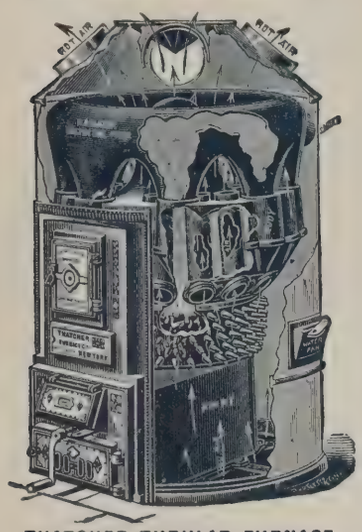
3 to 24 inches in Diameter.



2 to 25 feet Lengths.

For Ventilation, House Leaders, Exhaust Steam, Water Supply, etc.

ABENDROTH & ROOT MFG. CO., 28 CLIFF STREET, NEW YORK.
Send for Catalogue.



THATCHER TUBULAR FURNACE.

: : ESTABLISHED 1850 : :

The Thatcher Furnace Co.,

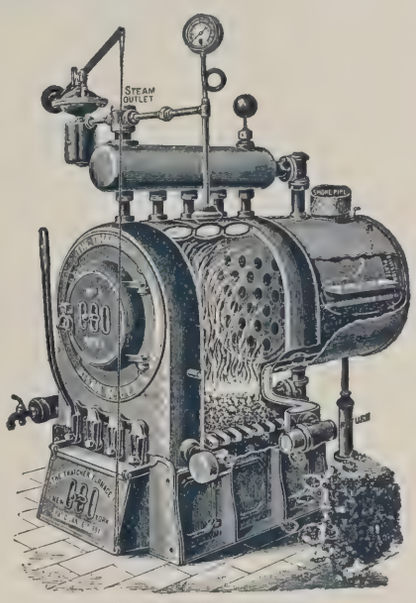
240 Water Street, New York.

Manufacturers of the Celebrated

Thatcher Tubular Furnace

: : : ALSO : : :

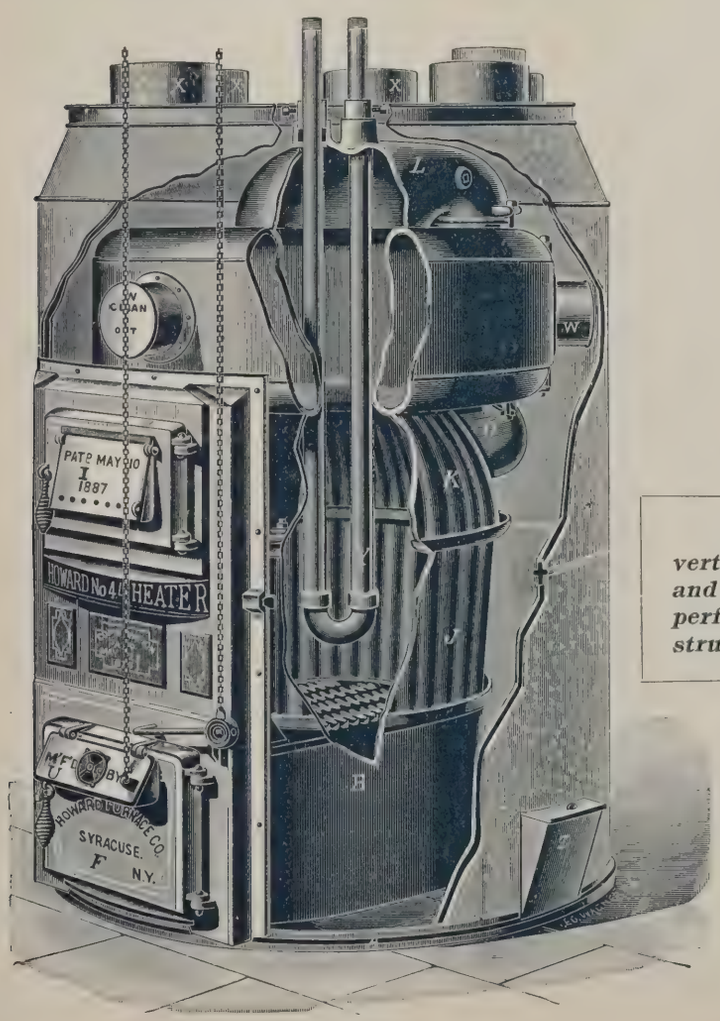
Champion Steam and Hot Water Heaters.



CHAMPION HEATER.

NOTWITHSTANDING the hard times the demand for these goods is steadily increasing. It proves the dealers want first-class goods at fair prices. . . . . .

SEND FOR CATALOGUE



HOWARD

COMBINATION

HEATER.

THE HEATING OF WATER IN A SEPARATE VERTICAL TUBE IS A SOURCE OF POWER.

By placing all the heating and absorbing surface vertically the water is presented in a column to the fire, and in the most favorable condition to be heated, allowing perfect freedom for the water to ascend upward, unobstructed by any CROSS CURRENTS.

MAIN OFFICE AND WORKS:

HOWARD FURNACE CO.

SYRACUSE, N. Y.

SOLD AT

New York, 210 Water St. *Grand Rapids, 38 So. Division St*

Boston, 61 & 63 Blackstone St. *Toronto, 337 Yonge St.*

CAPITOL HOT WATER HEATER

MASCOT STEAM OR HOT WATER HEATER

HECLA STEAM HEATER

United States Heater Company,

115 RANDOLPH ST.,
DETROIT,

100 Lake Street, Chicago.

110 Beekman Street, New York.

106 High Street, Boston.

OUR

NEW SECTIONAL

"SUNRAY"

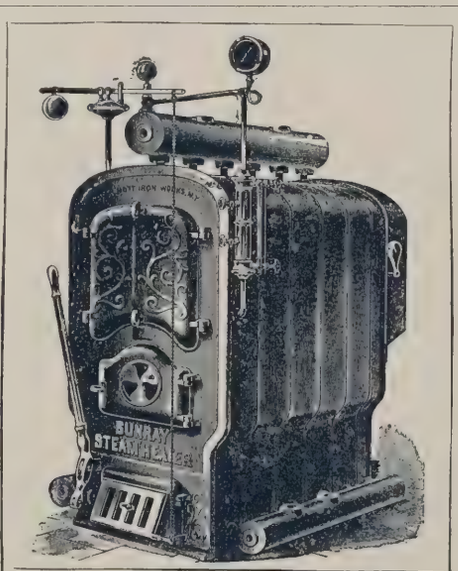
STEAM BOILER

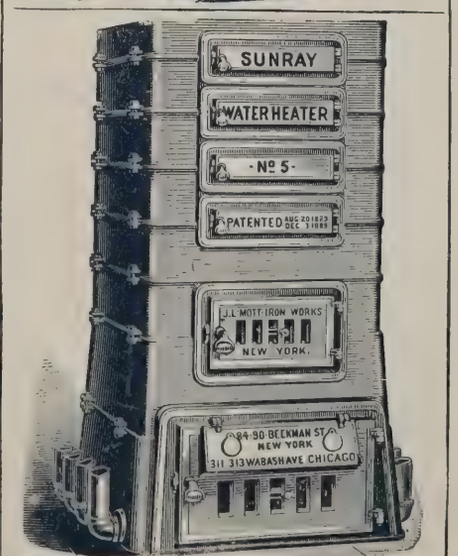
Made to carry from 450 to 2400 feet of Steam Radiation.

HAS MORE TALKING POINTS THAN ANY OTHER BOILER.

It is the easiest to sell, the easiest to put up, the most satisfactory to handle.

THE ONE THAT WILL ALWAYS GIVE SATISFACTION TO YOUR CUSTOMERS.





VICTORY

—) AND (—

CONTINUED SUCCESS

ALWAYS ATTEND THE DEALERS WHO HANDLE OUR

"SUNRAY"

WATER HEATERS.

No heater has ever been so successful.

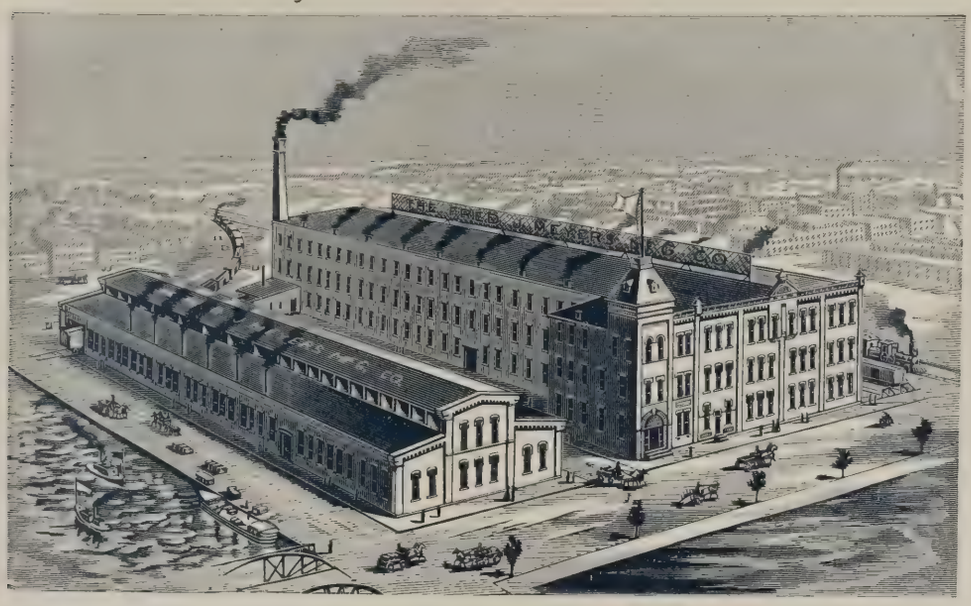
OVER 1,000 IN USE AND EVERY ONE GIVING THE BEST OF SATISFACTION.

SEND FOR NEW CATALOGUE AND PRICE-LIST.

The J. L. MOTT IRON WORKS,

84-90 BEEKMAN ST., NEW YORK.

311-313 WABASH AVE., CHICAGO.



Factory of the FRED J. MEYERS MFG. CO., Hamilton, Ohio.

Cold Weather WILL SOON BE HERE,

AND

NOW IS THE TIME

To arrange for the Heating and Ventilation of

Factories,
Stores,
Schools,
Theatres, Etc.

This Building is Heated and Ventilated by

The SMITH PATENT HOT BLAST APPARATUS.

(Read what the owners say below.)

HUYETT & SMITH MFG. CO., Detroit, Mich.:

HAMILTON, OHIO, March 13th, 1894.

GENTLEMEN: We have this day given the heating plant you put in our new works a test, and find that it fully meets all the requirements of the contract, and is in every particular as represented by you. The guarantee you made us when you sold us the plant is a strong one, and we hardly expected the same fulfilled, yet we must now say that the apparatus is even stronger and more powerful than the guarantee. We cannot say too much in praise of your man, whom you sent here to complete the contract. He certainly understands his business thoroughly, and has done exceedingly well in every particular.

THE FRED J. MEYERS MFG. CO.

CHICAGO, 31 So. Canal St.
NEW YORK, 26 Cortlandt St.
BOSTON, 48 & 54 Union St.
PHILADELPHIA, 118 Custom House Pl.

THE HUYETT & SMITH MANUFACTURING CO.,

Heating and Ventilating Engineers,

DETROIT, MICH.

ARE YOU SATISFIED

With your present System of Steam Heating?

WE ARE SATISFIED

That any System of Steam Heating can be greatly Improved by the application of the

ANDREW G. PAUL SYSTEM FOR REMOVING AIR.

A Saving to Manufacturers.
Circulation of Exhaust Steam without Back Pressure.
A Help to Contractors.
Perfect Circulation Guaranteed.
A Comfort and a credit to Engineers.
A Sure Saving of Fuel.
A Benefit to all Steam Users.
The most economical system of heating by Steam.

NOISELESS. **QUICK.** **POSITIVE.**

The system as may be seen in operation at our office can be easily applied to any old Steam Heating Plant.

NEW ENGLAND ENGINEERING CO.

No. 79 Milk Street, - - Boston, Mass.

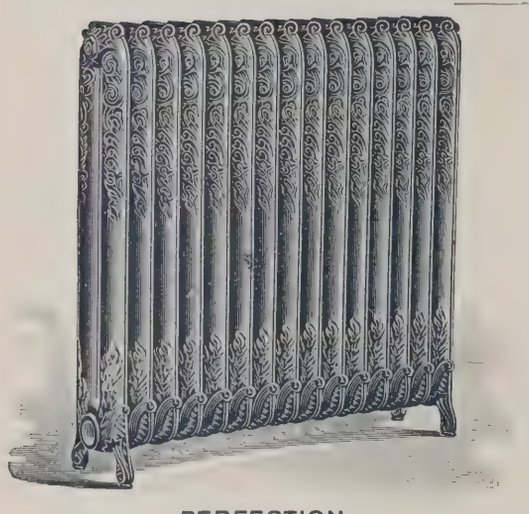
CORRESPONDENCE SOLICITED ESTIMATES FURNISHED.

THE

AMERICAN RADIATOR COMPANY

Largest Makers of Radiators in the World.

MANUFACTURERS OF



PERFECTION.

World Renowned

AMERICAN RADIATORS

(Trade Mark.)

Direct, Indirect,

and Direct-Indirect

RADIATORS

For Steam and Hot Water.

SEND FOR

New Price List

and

Note Reductions.

:o:

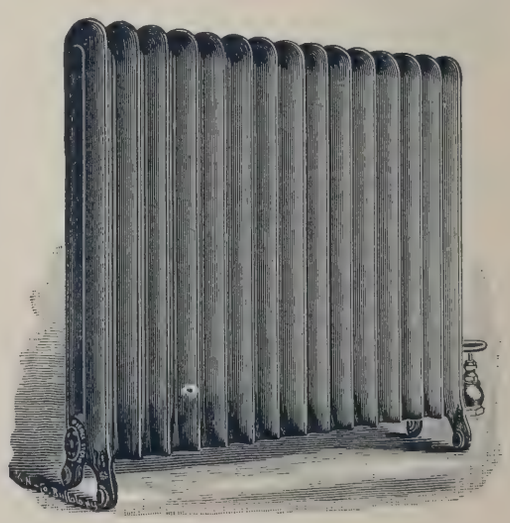
Our Facilities Unequaled.

:o:

Smooth Castings,

Handsome Designs,

Perfect Construction.



PEERLESS.

GENERAL OFFICES,
111 AND 113 LAKE STREET,
CHICAGO, ILL.

BRANCH OFFICES:

NEW YORK,
92 Centre Street.

MINNEAPOLIS,
330 First Street, North.

BOSTON,
44 Oliver Street.

DENVER,
1810 Blake Street.

FACTORIES:

DETROIT AND BUFFALO.

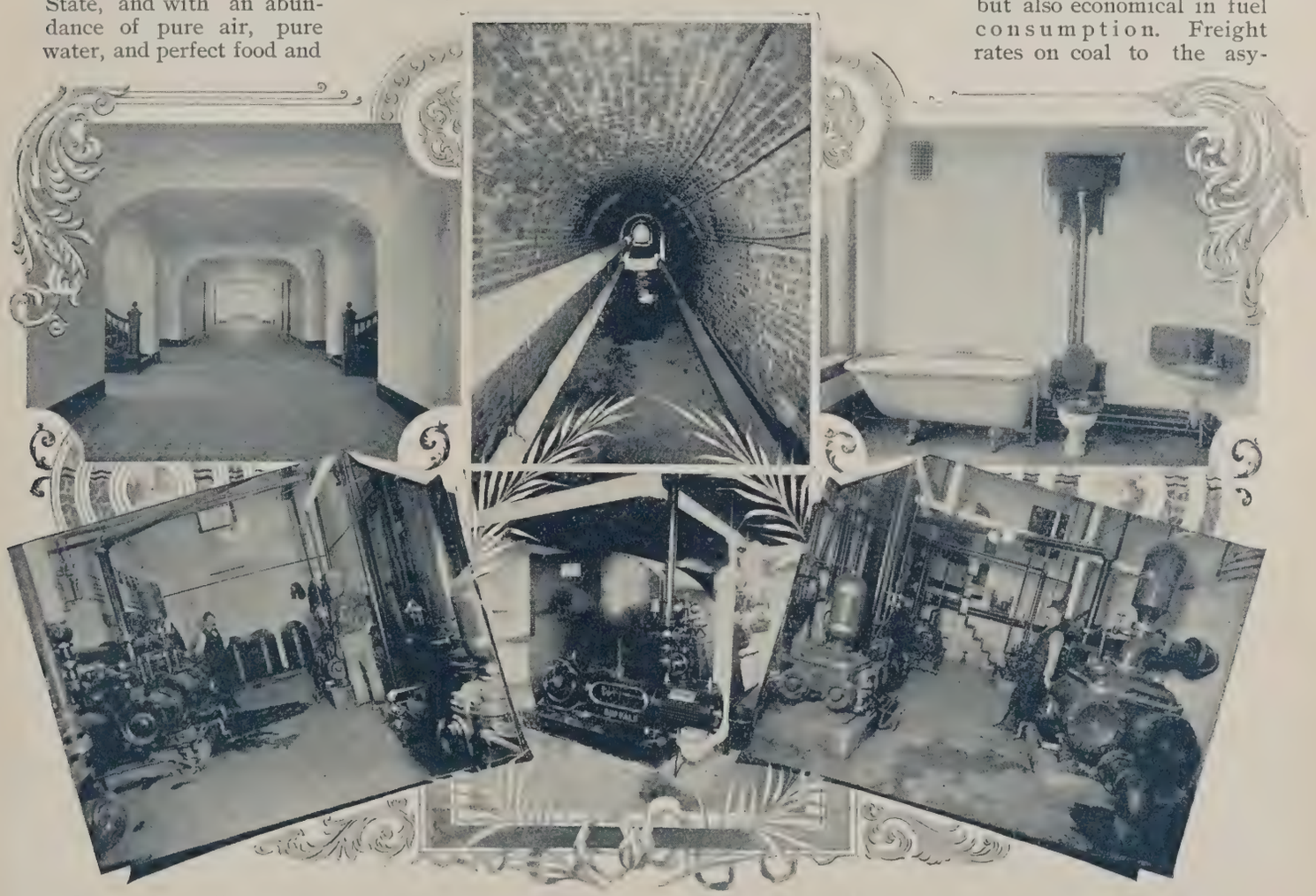
Heating and Ventilation

NEW YORK. (Copyright, 1894.) September 15, 1894. (All rights reserved.) CHICAGO.

Second West Virginia Asylum for the Insane.

About forty miles back from the Ohio river, at the town of Spencer, Roane county, the State of West Virginia has erected its second Hospital for the Insane, and situated picturesquely on the side of a great line of hills whose base of solid rock crops out at frequent intervals, as shown by the lower left-hand engraving on page 3.

The asylum buildings command a majestic view of the country for miles around. A more suitable location for such an institution could hardly have been chosen. Readily accessible by rail from all parts of the State, and with an abundance of pure air, pure water, and perfect food and perfect quiet, all the surroundings conduce to make it a proper place for the treatment of that most dreadful of human afflictions—disease of the mind. Fully realizing these natural advantages, the Board of Directors left no stone unturned to supplement them with the most modern sanitary appointments for such an institution.



Of the accompanying engravings, the upper left-hand picture on this page is a view of a hall in the administration building, showing the position of the hot air registers near the ceiling, and the foul air registers near the floor. The upper central picture shows the pipe lines and electric light wires in the tunnel between the power house and the asylum buildings. The upper right hand picture shows a bath room in the administration building, air being admitted through the upper register and exhausted through the one near the floor. The lower left hand picture is a view of the pump room in the power house, the lower right hand picture being a view of the same room from the opposite end, showing a compound duplex Snow pump at the right, and feed water heater, return pumps, etc., at the left and behind. The lower central picture is a view of the heating and ventilating apparatus in the administration building, the apparatus in the first and second ward buildings being similar in design.

Of the engravings on page 3, the one in the lower left hand corner is a general exterior view, showing the first and second ward and administration buildings, and also the power house. The upper central half-tone engraving on page 3 shows the high pressure steam piping under the air piping in the center and the low pressure Buffalo Forge Co.'s indirect heaters at the sides, with steam and drip connections.

Before deciding on systems of heating, ventilating, plumbing, sewerage, and water supply, a committee of the board visited many of the best State insane asylums in the country, and in consultation with their engineers, selected such features for the different buildings as seemed best for their several uses.

The principal object to be attained was such a plant that should not only be efficient and easily operated and permanent in structure, but also economical in fuel consumption. Freight rates on coal to the asylum town are high, and every feature tending to economy of operation was carefully considered, and the result of the season's operation amply demonstrated their great value. Simplicity as an important quality was imperative, as the engineer believes that economy of operation and simplicity generally go hand in hand. Two ward buildings for patients, each about 200 by 40 feet, and three stories high, and an administration building

for officers, about 200 by 50 feet, and four stories high, all of brick and stone with slate roofs, were completed last year. These buildings are shown in plan and elevation on page 3.

Some 500 feet away from and below the buildings is located the power house, on the bank of a creek. Each building has its individual heating and ventilating apparatus, with the boiler and pumping and laundry and electric lighting plants located in the power house. An underground tunnel 6 by 7 feet connects the power house and asylum buildings, and in it are located the main steam, water, and return lines and electric light wires. The general plan on page 3 shows the outline and system of apparatus, with detail sections of the second ward building and tunnel in the upper left and right hand corners respectively. The plenum fan system of heating and ventilating is employed in each building, a constant supply of fresh warm air being forced into all parts, forcing out at the floor line all foul air. In the first ward building a 120-inch Buffalo steel plate fan, ¾ housing type, exhausts the fresh air from the "fresh air and settling" chamber and blows it over the heating coils, and thence properly heated through the large plenum ducts, made of wood and lined with galvanized iron, to the bases of the vertical wall flues, and up these induction flues to the various rooms and halls of the building. The cross section of the first ward, as to flues and registers, is the same as that of the second ward.

The warm air inlets from flues to rooms are all located 8 feet above the floor, and all vents at the floor line. The vent outlets lead into the eduction flues and thence to attic and out. Each hot air inlet and vent outlet has an asylum key register. All vents are about two-thirds the fresh air supply. The fan is driven by a direct connected horizontal engine. This fan and heater were installed about two years prior to the apparatus in the other buildings, but the air ducts were remodelled, and the apparatus adapted to the general system by the engineer at the time of the general installation last year. The second ward building has individual heaters of the Buffalo Forge Co. indirect heater type, at the base of each set of flues, and a Buffalo steel plate fan exhausts the fresh air over a tempering coil, and thence blows the tempered air through horizontal flat galvanized iron ducts, suspended from the basement ceiling, to the small heaters, as shown by the small central half-tone cut on page 3. The outline detail section of the second ward building shows the arrangement of heaters and flues, while the half-tone cut shows the air ducts, their branches to heaters, and the steam and return lines. Low pressure steam at from two to three pounds pressure only is carried on these small heaters, and exhaust and low pressure live at two pounds only on the tempering coils. Fan engine's exhaust is also utilized in hot water heater in each building. These small indirect heaters are also arranged so that in case of a stoppage of the fan, a door can be opened in the bottom of each heater case, and upon the opening of the windows in the basement an ordinary indirect stack system of heating is in operation, and a comfortable temperature maintained until the fan is again started. Down through the central corridor of the basements and their connecting passages run the high pressure steam lines and the return and water lines.

The small heaters in the second ward building are arranged in sets, with a high pressure steam branch for each set, with a reducing pressure valve and steam gauge on it, and a low pressure line feeding to the heaters. In moderate weather the tempering coil alone suffices for heating the building. Dampers and adjusting devices are arranged for each flue, so that the supply of air is uniform to the various floors, and cold or tempered air by-passes are arranged so that tempered air can be mixed with the hot air, and the temperature lowered without lessening the volume of air supplied.

All water of condensation from heaters and tempering coils returns by gravity through protected pipes to the return pumps in the power house, and thence to the boilers, and all steam and return piping is covered with heavy moulded asbestos covering, the water of condensation reaching the boilers at a high temperature. In the boiler house a 150 horse-power Berryman feed water heater (made by I. B. Davis & Son, Hartford, Conn.) serves to heat whatever additional feed water for the boiler which may be required above that returned from the heating apparatus.

Some time after the installation of the plant was completed, and on the occurrence of zero weather, a thorough test of the plant, including air meter tests at all hot air and vent registers and thermometric readings at numerous points on all floors and in all rooms of all buildings, was made, and showed a complete change of air in the first and second ward buildings every ten minutes, and in the water closets every 8 minutes, an average and uniform temperature of 70 to 74 degrees in all parts; an inflowing velocity of air at the registers of 500 feet per minute, with average temperature of air at the registers of 110 degrees, low pressure and exhaust steam only being used on the heaters.

There is delivered into each building 1,680,000 cubic feet of air per hour. A prominent West Virginia paper, in describing the ventilating effects says: "When one enters the buildings, even those wards occupied by the most unruly patients, no unpleasant smell or odor greets the visitor; and a constant heathful temperature, absence of all impure air, and ample supply of fresh warm air give the inmates a salubrious Florida climate in the coldest weather, and are a pleasant surprise to the visitor, who expects to meet the usual air and foul, or at least, 'close' atmosphere of such institutions."

The apparatus in the administration building is arranged with a fan of the same design as in other buildings, exhausting the fresh air over a mass of heating coils, and blowing the heated air through galvanized iron ducts suspended from the basement ceiling to the vertical wall flues and thence to the various rooms heated. The test of this building showed a change of air every 9 to 10 minutes; average temperature, 74 to 76 degrees, and delivery into building of 1,800,000 cubic feet of air every hour.

A system of reports was adopted soon after the the installation of the plant by which night and day an hourly record of temperatures and air conditions on each floor of each building is made. A similar complete record of fuel consumption, water pumped, and all detail data is kept, thus affording a reliable, practical, and continuous test of the plant under all conditions of weather and winds. It will be noted that all apparatus and heating surface is massed at points in the basements where it is under the constant supervision of the resident engineer in charge of the plant.

These buildings stand exposed to the severest winds which sweep up the valley, and which are certainly effective tests of the heating and ventilating apparatus. The power house is two stories high, divided on the first floor into boiler, fuel, pump, and electric lighting rooms. In the boiler room are four 60 horse-power and two 40 horse-power boilers, manufactured by the Pennsylvania Boiler Co., Erie, Pa. The boilers are connected up singly or in battery. A 100 foot stack, 6 by 6 feet inside, provides a splendid draft. In the pump room are located the large compound duplex Snow water pump, made by the Snow Pump Co., Buffalo, N. Y., which lifts the water from the supply reservoir or crib in the creek below and forces it up to the large reservoirs on the hills behind the buildings, with a pressure of 90 pounds on the water gauge at the pumps. This pump supplies all the water for the aslyum proper. Fire plugs are provided at conveniently accessible points on the grounds and the piping is arranged so that the pumps can be used direct on the fire apparatus. There are also a reserve water pump and two large return pumps and receivers, which receive the hot water for the heating apparatus and pump it back to the boilers; also injectors (Penberthy Injector Co., Detroit, Mich.) and feed water heaters. The electric lighting room contains the dynamos (Westinghouse Electric & Mfg. Co., Pitttsburg, Pa.) and engines (J. H. McEwen, Ridgway, Pa.)—all buildings, power-house, and tunnel and grounds being lighted by electricity.

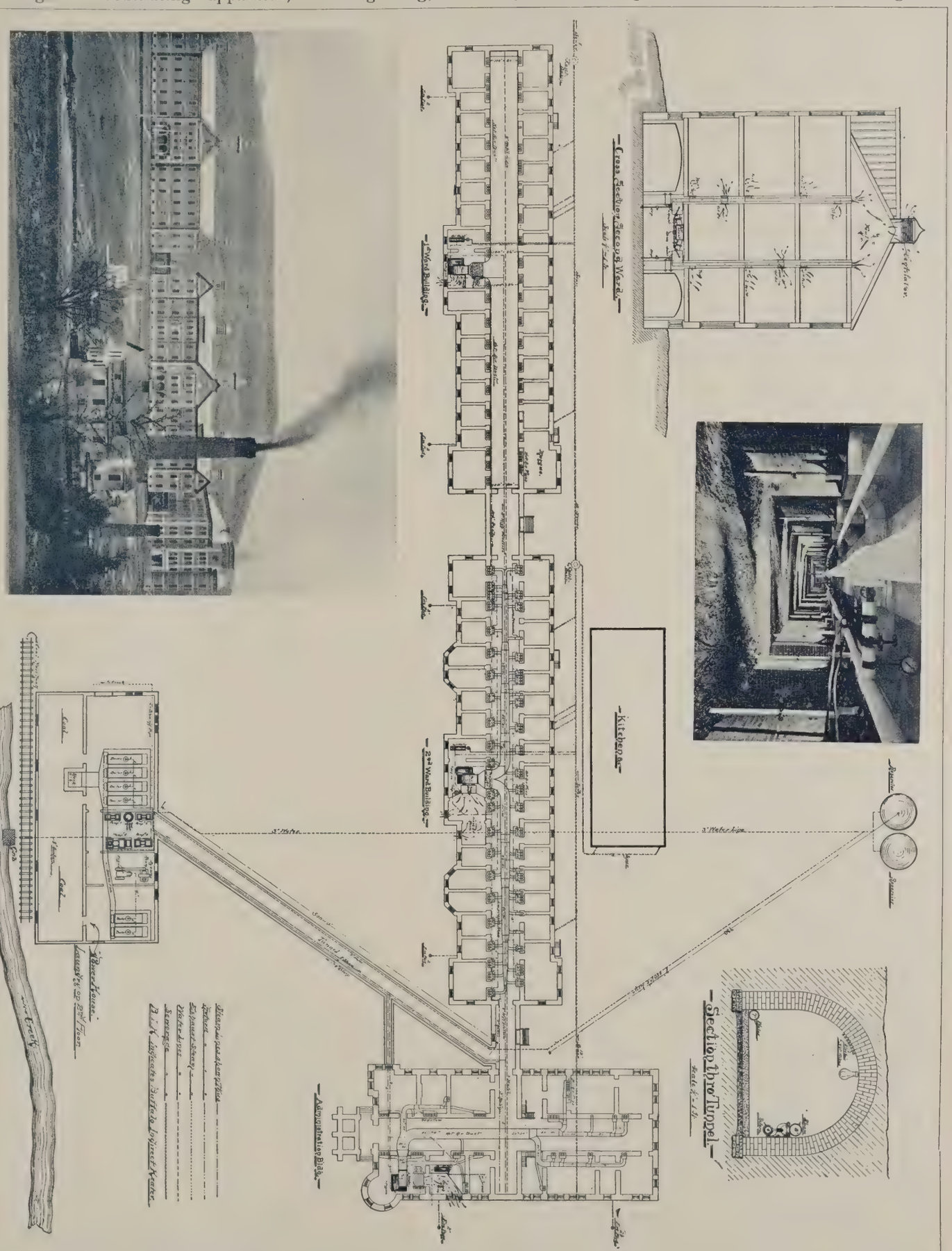
The difference in steam pressure observed between boilers and fan engines in ward buildings was from 1

to 2 pounds, a most striking evidence of the efficiency of the arrangements for the best possible utilization of all the heat in the steam system.

The plumbing and sewerage arrangements are on a par with the heating and ventilating apparatus, attachments, wash stands and slop hoppers, and a clothes drying room on each floor. Each floor of the administration building is likewise equipped with baths, closets, wash basins, and sinks, the fixtures in this building being, of course, more ornamental than those in the ward buildings, in harmony with the other furniture and fittings. Nearly all the plumbing fixtures are of the J. L. Mott Iron Works make, and of the latest patterns for their several uses.

The sewerage is an extensive piece of work, depth averaging 12 feet, and all flows to a point in the creek about three-fourths of a mile below the water supply, thus avoiding all possible contamination. Two catch basins are provided, behind the buildings and in the sewer, for the interception of any clothes, shoes, etc., which the inmates frequently throw in the closets.

On the second floor of the power house is located the laundry, containing two engines, four washing



machines, and centrifugal wringers, soap tubs, ironing machines, and drying coils, etc., all in duplicate, thus preventing any delay due to breakdowns. The dry room is heated by exhaust steam from the laundry engines.

This entire plant was designed and the plans and specifications prepared by Mr. H. B. Prather, mechanical engineer, of Buffalo, N. Y.. the engineer employed by the Board of Directors. The firm of Trimble & Lutz, of Wheeling, W. Va., secured the contract for and installed the work, all in accordance with the plans and specifications, and gave entire satisfaction in every detail. The fans and heating apparatus, especially designed for this plant, and made by the Buffalo Forge Co., are models of working and efficiency. A description of this plant is especially valuable and instructive in that it treats of an accomplished fact, a successfully operating plant on modern lines of design, and not a merely proposed system whose merits are to be demonstrated.

Proper Heating of Buildings.

One of the most important subjects we have to deal with in the northern latitudes of the United States, says J. C. Henderson, is the proper heating of public and private buildings. It is now so intimately connected with the health and comfort of the people as to demand the best practical and scientific thought. Where artificial heat must be maintained for more than half the year the question of economy as well as healthfulness must receive attention.

The advancement of society in more refined modes of living, and the increasing demand for more of the substantial comforts and conveniences adapted to the higher conditions of life, call for still further improvements on former modes of securing the warmth and ventilation of apartments, both those of the home and those in which the great assemblies congregate. Attention must, therefore, continue to be directed to the best means of securing the maximum of health and comfort at the minimum of expense for fuel and outlay of care in attendance.

Adherence to the sense of refinement requires that the heating apparatus be placed in the basement of the building, confining dirt and fuel to that portion of the house. The artistic and utilitarian faculties unite in this requirement, which leaves the living apartments free and unobstructed for use, comfort, and adornment.

The plan of placing a hot air furnace in the cellar, conducting the heat to any and all desired apartments of the house, has important advantages over radiating heat directly from stoves or steam radiators. The supply of warm air from a furnace is fresh and more healthful, for the reason that more perfect ventilation is secured by a continuous change of air throughout the house. In halls, churches, and school buildings this mode of heating is more important, for where large numbers of people are congregated a more thorough ventilation is necessary than would be the case where stoves or steam radiators heat the same air over and over.

Practical Ventilation Work—III.

BY VENT.

In this article shall be described and illustrated that which is commonly known as gas-light ventilation, and which was placed in a private residence recently erected at the corner of 169th street and Fulton avenue, New York.

The ceilings over the chandeliers

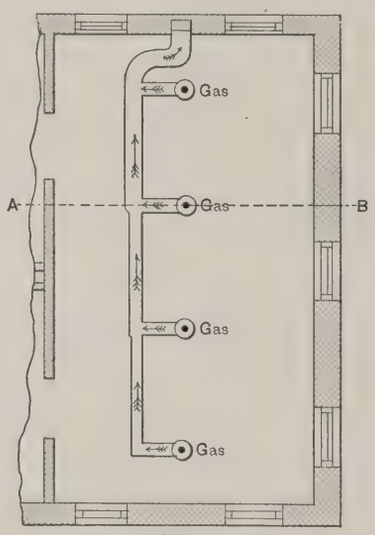


Fig. 12.

in the reception, smoking, and billiard rooms are all ventilated by means of galvanized iron ducts connected to brick flues, the flues running up as high as the attic floor, thence to the metal ventilator above the roof. In Fig. 12 is shown the plan of the galvanized iron ventilating ducts on the ceiling of the smoking room. The method here employed is the same as

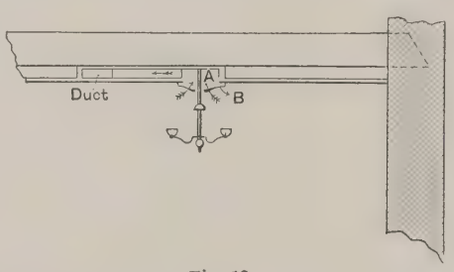


Fig. 13.

that in the reception and billiard rooms. Fig. 12 also shows the position of the chandeliers, over which the receivers are placed and connected to the ducts, the size of the duct increasing according to the number of lights burned.

Fig. 13 represents an enlarged section taken on the line *A B* in Fig. 12

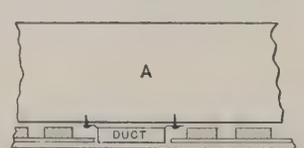


Fig. 14.

showing the position of the chandelier over which the metal receiver *A* is placed. *B* represents the sheet metal ventilating center-piece, fastened to the ceiling before the white plaster is completed. Now let us suppose that a number of lights were burning in the reception room; the heat of the gas lights would pass upwards and out through the galvanized iron ducts. In the smoking room the heat of the gas lights, rising and passing through the ceiling ventilator, would create an upward draft and would continually be exhausting the smoke from the smoking room, when in use.

Fig. 14 indicates the method of

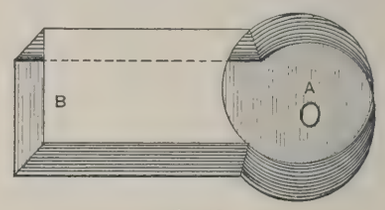


Fig. 15.

placing and fastening the ducts to the beams. The ducts are usually made as high as the combined height of the furring strip and the plaster lath, which is about 1½ inches, and in width according to the number of gas lights in use. As the ducts are not heavy, they can be fastened with wire, as shown in Fig. 14. Fig. 15 represents a perspective view of the sheet metal receiver with part of the duct *B* attached; the hole cut out at *A* allows the gas pipe to pass through, and should be no larger than necessary.

Fig. 16 shows an enlarged plan view and a section of the sheet metal ventilating center ornament. *A*, in the section, represents the gas pipe over which the center piece is slipped, and then with long wire nails it is fastened to the furring strip. Care

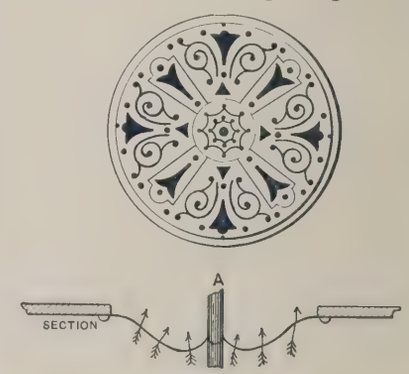


Fig. 16.

should be taken to drive the nails through such places as cannot be noticed from below. The arrow lines shown in section in Fig. 16 indicate the flow of heated air through the perforations in the center ornament. After the latter is in place the white plaster work is finished, thus making an air-tight joint between the metal and the plaster.

A vacuum chamber upon the suction pipe, close to the pump, is always an advantage, and on long lines of pipe, or on pumps running at a high rate of speed, is absolutely necessary. Its utility consists in causing a steady and uniform flow of the fluid through the suction pipe, and thus preventing pounding or water hammering, which is always incident to long suctions.

Steam Pipes in Central Stations.

Considering that immunity from break down in central stations depends to a large extent on the arrangement of the steam piping, it is not surprising to find the engineers of such plants giving increased attention to this important detail. In the Portsmouth central station, says our English contemporary the Mechanical World, Messrs. Yates and Thom, instead of arranging the steam pipes in a ring main, have provided two entirely separate ranges of main and branch steam pipes, so that each engine has two separate connections to the boilers. Each boiler is provided with two stand-pipes termining in stop valves, each of these stop valves being connected through six-foot spring lengths with each of the separate ranges running across the boilers. These main ranges, which are ten inches in internal diameter, are provided each one with a through valve immediately where the ranges pass away from the boilers. The steam pipes are carried to a common point within the engine room, and are then continued one range over the other down the center of the engine room. Branch pipes, five inches in internal diameter, connect each range separately to each engine, and a stop valve is provided at the root of each branch pipe where it joins the main, in addition to the two stop valves on each engine. This double system of steam connection has been carried out even to the smallest engines employed, so that no portion of the plant is likely to fall short of a supply of steam through accident. A water separator is inserted in the run of each steam pipe just before it reaches the engine-room wall, to insure the steam being freed from water before reaching the engines, and at the extreme end of the steam pipes water-catchers are provided to receive the condensed water therefrom, both the water-catchers and the water-separators being connected with the drains through suitable steam traps. We may add that great care has been exercised in the construction of all the steam pipes, and that both the mains and branches, with the exception of the branches to the pumps and conveyor engines, are made of mild steel plates. The requisite allowance for expansion and contraction has been provided for without the provision of any expansion joint, the steam pipes being so arranged that long legs are formed at right angles to the main run of the pipes; these legs having sufficient elasticity in themselves to allow for the elongation of the main pipes.

Careful firing is a good smoke preventive. No matter if the draft is good, and the best quality of bituminous coal is used, unless the coal enters the fire box in the proper manner there will be more or less black smoke issue from the stack, representing a lack of combustion and waste of fuel.

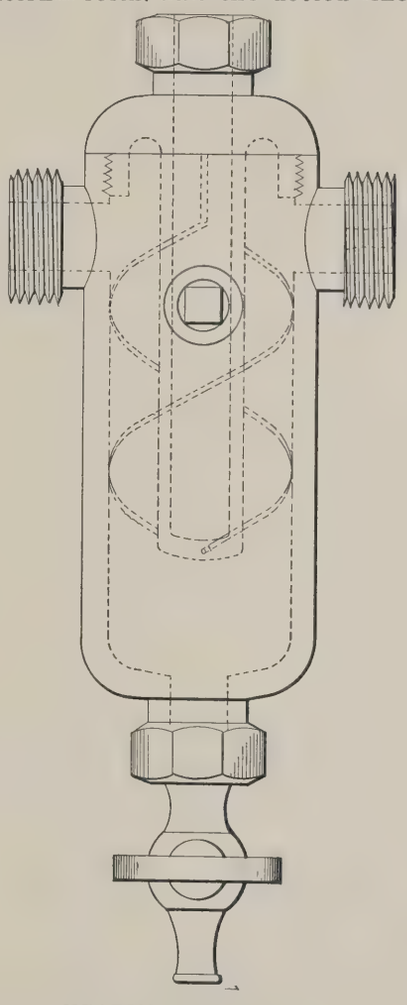
Combined Throttling and Measuring Calorimeter.

BY A. HEATON.

Having just finished, for personal use (not for sale) a combined throttling and measuring calorimeter, it occurs to me that the accompanying sketch and description of it might be of interest to others.

The instrument is composed of two castings screwed together near the top by means of the hexagonal ends. The head is cast in one piece with the thermometer pot and its two spiral webs which divide the body of the instrument into two halves—the entire steam passing down one of the convolutions and up the other to the escaping point.

The full lines in the cut show the external form, and the dotted lines



HEATON CALORIMETER.

indicate the internal arrangement. The boss, with a one-eighth of an inch plug in front, is for a manometer, although none will be necessary with initial pressures not exceeding eighty pounds to the inch, as the half-inch escape (assisted by the quarter inch pet cock if necessary) is ample to expand down to atmospheric pressure when used for throttling, and when used for measuring, the thermometer gives the corresponding temperatures for all pressures.

All the projecting parts are necked in, to make a better fit for the felt covering. One of the steam connections has a full half-inch hole, but the opposite one is bushed down to a standard ⅛-inch opening.

To use it as a throttling calorimeter, the one-eighth side is connected to the union, and steam is permitted to escape at the larger hole. For measuring, it is connected up the other way, allowing the steam to escape at full pressure from the one-eighth inch hole, at the same time closing the pet cock, and weighing the water which collects in any given time; or a skeleton tube (inclosing a graduated glass one) may be inserted between the bottom of the chamber and the pet cock.

Boiler Settings.

The brickwork about boiler settings is often very imperfectly laid. It is mostly done by contract, with no one to supervise it who understands the severe use to which it is to be put. The bricklayer, who may never have worked on a job of this kind before, builds good-looking inside and outside walls but the space between is apt to be filled with odds and ends in the most promiscuous manner. Furthermore, he puts the same joint in that he would use if he were building a house, and this is just what we do not want in a boiler setting, particularly in the fire brick lining of the furnace. The joints throughout the setting should be thin, and the work should be done as faithfully inside as outside. Some sort of prepared fire-clay is used in laying the fire brick, and it should be mixed up so thin that it cannot well be used with a trowel. Some mill owners who may have had experience in this direction will not allow a trowel to be employed at all, but require the men to use iron spoons. The fire bricks should be dipped in water as they are used, so that when they are laid they will not immediately "drink up" the water from the cement. They should then receive a thin coating of the prepared fire-clay or kaolin paste, and be carefully placed in position with as little of the kaolin or fire-clay as possible.

Every sixth course, beginning with the grates, should be a row of headers, well bonded into the masonry behind. The headers are of little use unless they are well secured into the walls of the setting, for when the lower courses of fire brick have burnt away more or less, we have to rely on these headers to a considerable extent to hold the upper part of the wall in position. In repairing fire brick linings, the lower courses, which burn out fastest, can be removed and replaced without disturbing the upper part of the wall, provided the headers are secure, while if they are not, the entire wall may have to be rebuilt, and this cannot be done without either removing the boiler or tearing down a considerable part of the setting.—Machinery.

The coal industries of 38 States employed 229,400 men last year, and paid out $110,000,000 in wages.

Steam Pipe Covering.

BY WALTER MEYER DICKINSON.

To show the great value of covering steam pipes the following is urged. Numerous experiments with naked pipe show that a two-inch one, carrying steam at sixty pounds pressure, will condense per hour 180 grams of water per lineal foot.

From the following formula one can calculate the tons of coal per year saved by a good covering. Let A equal grams of water condensed per lineal foot per hour by naked pipe; B, grams condensed per foot per hour by covered pipe; C, the number of feet of pipe; D, the number of hours in working day; E, number of working days in year. One gram equals .0022 of a pound. One pound of coal will evaporate eight pounds of water. One ton equals 2,240 pounds. Representing by T the number of tons of coal saved per year, then

$$T=(A-B)\ C\times D\times .0022\times E\div 8\div 2240$$

Then by multiplying the number of tons by the price per ton we get the amount saved. For example, let $A=180$, $B=38$, $C=100$, $D=10$, $E=300$, we have $180-38=142$. Then $142\times 100\times 10\times .0022\times 300=93{,}600$, and $93{,}600\div 8\div 2240=5.2$ tons.

Allowing $5 per ton, which is often the price in the cities, $26 are saved in one year. This would pay for the covering and insure the saving of a like amount each year. Where there are many hundreds of feet of pipe used, the necessity for covering it is evident.

The apparatus which I used is the same in principle as that of Professor Luttgew, only much larger. By an inspection of the cut one can see at a glance how the tests were conducted. The apparatus is compact, and yet the pipes are far enough apart (two feet) to prevent radiation from any one pipe affecting its neighbors. In the construction of this apparatus I was extremely careful to keep all water of condensation from entering the test pipes, thereby coming nearer the exact value of the coverings in question. The steam used must first pass through the separator B, up, over, and down to the branch that supplies the test pipes. Directly under this supply pipe is a collector, A, to collect any water that has escaped thus far or accumulated. At distances of two feet there are tees, to which are joined one foot of pipe; the test pipes are joined to these by an elbow. The test pipes have a slant of eighteen inches in thirty feet, in order to drain off the water of condensation, which accumulates in the collector at the end of the respective pipes. This water is accurately weighed, and by comparison of weight the relative value of the coverings in question is ascertained.

The main features of a good covering are as follows: It must be a good non-conductor, contain nothing that will harm the pipe in case the material gets into solution due to a leak. It must also be fireproof. There are various other requirements, according to the treatment the covering is to receive.

As dead air is the best non-conductor, substances that contain the most of this for the least weight are used in the manufacture of coverings in connection with some fireproof material. The coverings used in these tests were all 2-inch, in sections three feet in length, cut longitudinally and easily placed on the pipe, making a neat appearance.

No. 1, composed of asbestos and sponge felted; price per lineal foot, 30 cents; weight per foot, 911 grams.

No. 2, composed of rock wool or felspar and limestone melted down and treated with steam; price per lineal foot, 27 cents; weight per foot, 538 grams.

No. 3, composed of asbestos fibre, carbonate of magnesia, and a light cementing compound, moulded and surrounded by a jacket of non-porous felt; price per lineal foot, 24 cents; weight per foot, 636 grams.

No. 4, composed of a lining of asbestos sheathing, then three-quarters of an inch of mineral wool, around which is a jacket of one-quarter of an inch of wool paper

TABLE I—GRAMS PER LINEAL FOOT FOR EACH RUN.

Number of Covering.....		1	2	3	4	5	6	7	Press.	Temp.
" " Run.	1	44.5	35.8	49.5	38.3	41.2	55.2	211.2	80	83
" "	2	44.1	35.05	48.1	39.7	44.08	55.9	208.5	79	81
" "	3	43.2	35.9	46.	39.5	44.8	55.2	204.05	78	81
" "	4	43.	37.1	46.03	39.5	43.3	55.7	204.6	73	86
" "	5	44.4	38.4	46.9	40.	44.2	57.8	200.3	81	79

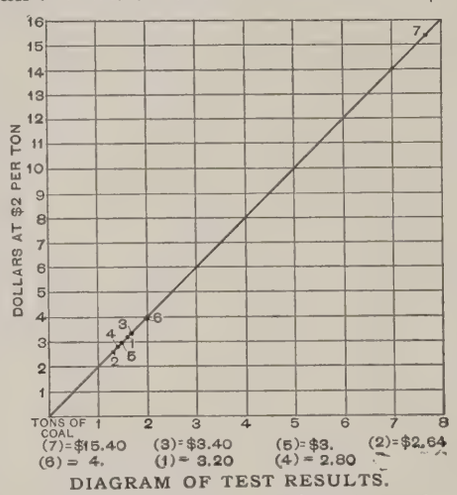
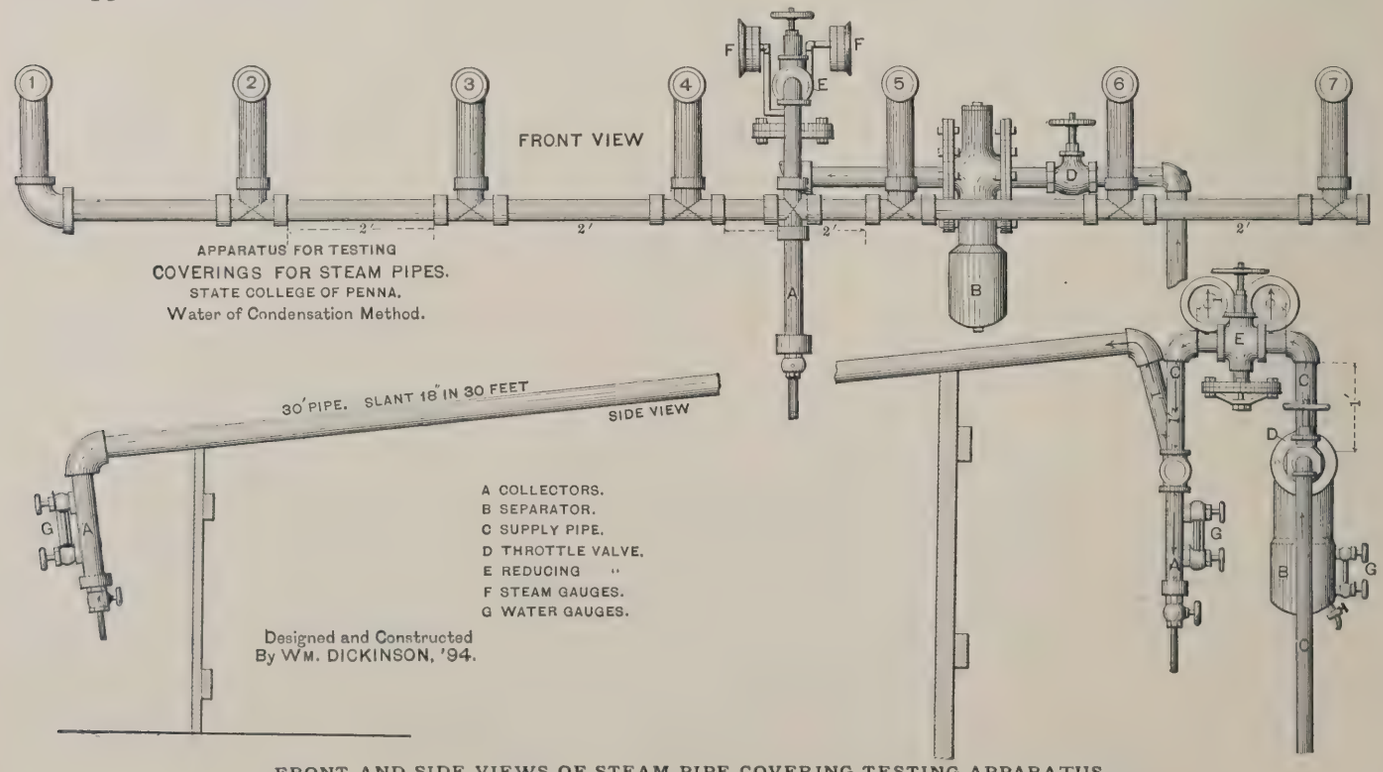


DIAGRAM OF TEST RESULTS.



FRONT AND SIDE VIEWS OF STEAM PIPE COVERING TESTING APPARATUS.

felt; price per lineal foot, 33 cents; weight per foot, 1,305 grams.

No. 5, composed of asbestos fibre, pure carbonate of magnesia, other mineral matters, and moisture; price per lineal foot, 25 cents; weight per foot, 541 grams.

No. 6, composed of an inner core of moulded asbestos cement one-half inch thick, an outer body of wool felt, same thickness; price per lineal foot, 27 cents; weight per foot, 1,044 grams.

No. 7, naked two-inch pipe.

The tests were five in number, each being six hours in duration. Before the run began the apparatus was allowed to heat up. The water level in all collectors was equal, and maintained that way during the run by allowing it to drop out as it condensed, thereby allowing the run to begin and terminate with the water at the same level. The room in which the experiments were conducted was dry and free from all drafts. All instruments used were standard. The results of the runs are given in Table I, which shows grams per lineal foot per hour for each run, and table II, which is a log of the five runs, the mean of which gives the final results of the tests.

The curve shows the money saved per year under the following conditions. First, that 100 feet of naked two-inch pipe in one year of 300 working days of ten hours each will condense water that has a coal equivalent of 7.7 tons; second, that coal is $2 per ton; third, that *A* equals 210.7 and *B* equals the different values shown by the respective coverings.

To read the curve, subtract the amount (corresponding to number of covering) from $15.40 and you have the amount saved per year by use of that covering. For example, No. 2 causes an expense of $2.64, which subtracted from No. 7, or $15.40, involves a saving each year of $12.76.

A glance at the curve shows how all uncovered steam pipes increase the expense of a plant. Another item of great importance is the wear and tear on engines, which is greatly reduced by dryer steam.

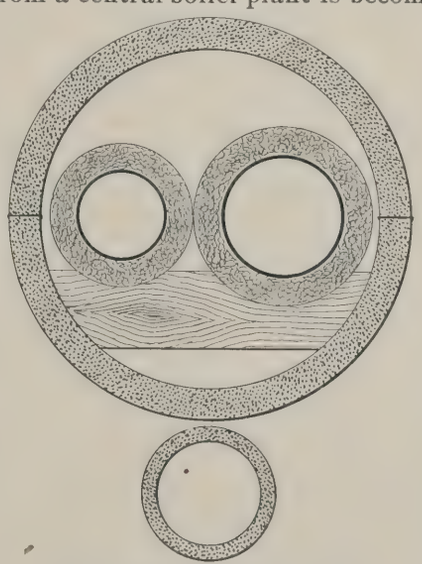
In conclusion, I would say that my experiments show: (1) that covering No. 2 is best, No. 4 being next; (2) that there is no choice between No. 1 and No. 5, as there is a difference of only half a gram per foot per hour; (3) that next in order comes No. 3, followed by No. 6.

TABLE II—LOG OF TESTS.

Number of Covering	1	2	3	4	5	6	7	Pressure.	Temperature.
	4622	3084	4686	4056	4286	5846	5273		
	3399	3364	4238	2853	3147	4098	5672		
							6567		
							6839		
							6056		
May 14, 1894, Six Hours							5622	80	83
	4958	4021	5413	4524	5014	6364	6091		
	3070	2409	3245	2629	2923	3699	5881		
							6175		
							5777		
							6399		
May 15, Six Hours							7391	79	84
	3895	3413	4413	3636	4007	5126	6175		
	3881	3357	3858	3470	3847	4811	6567		
							6559		
							6343		
							6119		
May 16, Six Hours							5567	78	81
	4944	4049	5517	4599	5070	6587	6396		
	2818	2643	2769	2524	2728	3448	6363		
							6839		
							6559		
							6895		
May 17, Six Hours							3843	73	86
	4007	3385	4322	3734	4350	5629	5749		
	4000	3532	4133	3476	3609	4777	5888		
							5832		
							6567		
							6937		
							5538		
May 21, Six Hours							5391	81	79
Total Grams	39594	33317	42604	35507	38981	50385	189710		
Grams per Lineal Foot per Hour	43.9	37	47.3	39.4	43.3	55.9	210.7	78	282

Underground Steam Pipes.

Carrying steam pipes underground from a central boiler plant is becoming more generally practiced, particularly for large institutions requiring much heating. A common way of doing this is to have a brick conduit made to contain the steam and return pipes. As this is a rather expensive job, it has been sufficient in some cases to prevent the use of the advantages of a central station. We show a similar method that has been in use carrying steam from a battery of boilers to one of the buildings of the Iowa Agricultural College, according to the Sibley Journal. Both the steam and return pipes were laid in the same trench, and were laid with a grade of five-eighths of an inch in ten feet, and drained towards the boilers. The steam pipe was 5 and and the return pipe 3½ inches in diameter. The trench was dug to grade. It was about 20 inches wide at the bottom and not much more at the top, the soil being clay and the season dry. The depth varied from 4½ to 9 feet. Below the grade of the trench was laid a line of 4-inch drain tile, which was connected with the drainage system of the college grounds.



UNDERGROUND STEAM PIPES.

The outside covering or conduit for the pipes was constructed of 15-inch vitrified sewer tiles, laid with joints of best Portland cement. To facilitate the laying the sewer tiles were halved lengthwise by means of a set hammer. It was cheaper to split the tiles than to buy half tiles from the tile works, the cost of whole and half tiles being the same per foot. The corresponding halves were marked for identification and were called uppers and lowers. The lowers were first laid and their joints made with Portland cement. In laying the lowers the proper grade was obtained by a long straight-edge and level and verified by the Y-level and rod. At intervals of 6 feet wooden chairs were placed. These were sawed from 2-inch plank to fit the inside of the tiles and the outside of the covering of the steam and return pipes, and were dipped in asphaltum paint. The steam and return pipes were laid upon these chairs, two or three lengths being screwed together at one end for a start. The first section of each pipe was raised from the chairs, first at one end and then at the other, to allow of the placing of the non-conducting covering. Then two more lengths of each pipe were added to the line and the covering applied by raising the advancing end to clear the chairs by the necessary amount, and so on until the whole line was laid and covered. The uppers were then placed and all joints made in Portland cement. Back-filling completed the job. Expansion was provided for by ample offsets at the ends of the line. The non-conducting covering used on the pipes was mineral wool sectional covering; the sections were joined with pasted strips of heavy paper and cloth.

The main difference between anthracite and bituminous coal is that the former is devoid of volatile matter.

Water at high temperature cannot be raised any considerable distance by suction, as the vapor discharged from the water so heated follows the receding pistons of the pump and resists the entrance of the water; consequently to pump hot water, always place the supply above the pump, so that it will be supplied from a head.

Tests of Condensation in Cast-Iron Radiators.*

BY WILLIAM J. BALDWIN, M. A. S. C. E.

The writer had occasion recently, in connection with his professional work, to make some comparisons as to the relative efficiencies of several of the regular makes of cast-iron radiators now on the market, and ones that are considered good types of direct cast-iron radiators. The results of the experiments hereinafter given were obtained on four of these radiators that were selected as a standard of comparison for a new radiator about to be put on the market. The results of these experiments are given to this Society—as they form valuable data by which an engineer can approximate the amount of condensation likely to take place in the heating apparatus of a building, and also show how near the line of condensation agrees in steam pipes with a line of the difference of temperature between air and steam.

The writer is compelled to omit the name and make of these four types, but as the results run so nearly together he presumes it is not necessary to go further than to say that they are the ordinary well-known types of cast-iron sectional radiators that are so much used at the present day. All radiators were of 48 square feet of surface, according to their commercial rating, excepting that designated as No. 3, which contains 52 square feet, and which, when reduced to the value of 48 square feet, gives the dotted line shown and designated as *X X*.

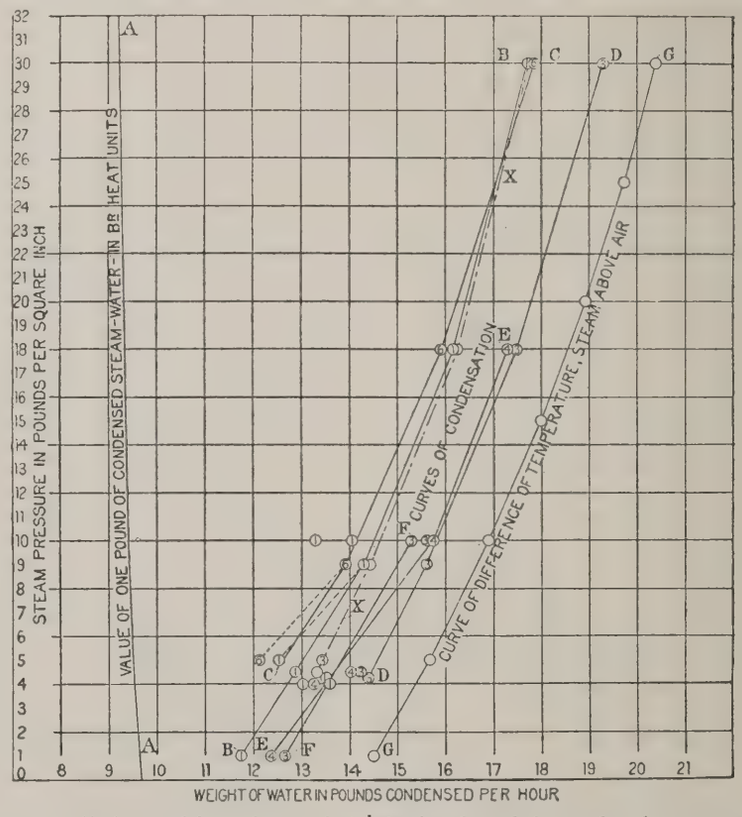
The method of comparison was that known as the condensation test, the only one which is of any value in determining the comparative value of radiators, and consisted of taking steam from a boiler at 90 pounds pressure and conveying it in a 1-inch pipe to a water separator. This water separator was trapped in the usual manner with a Mason trap. From the top of the separator a 1-inch pipe led to a reducing pressure regulating valve, and from the pressure regulating valve it led into a header of 2 inches inside diameter. The connection for each radiator was made of ½-inch pipe, taken from the upper side of this header through a short nipple, and thence by another short nipple into the radiator, an angle valve being used at the corner. It is probable that the condensation taking place in the two short nipples and in the valve was carried forward into the radiator; but, the quantity being so small, it has not been considered, as it was the same in each case.

The radiators were placed on platforms 2 feet above the floor and 36 inches from center to center. Over each radiator was placed a frame covered with muslin. The muslin in all cases was 6 inches from the sides and ends of the radiators, and the frames were opened top and bottom. The frames had the same perpendicular height as the radiator, and were raised sufficiently (about 6 inches) to permit an uninterrupted flow of air to the radiator underneath the lower edge of the frame. This method enclosed each radiator in a cotton box, as it were, and interposed two thicknesses of muslin between opposing sides of radiators, so as to cut off almost entirely the effects of radiation from one radiator to another. The tables on which the radiators were set had an inclination of about one inch to the drip end, so that the condensation could easily gravitate to the apparatus for collecting the water.

The apparatus for collecting and measuring the water consisted of a ⅜-inch "tail pipe," on the side of which was a short ordinary water gauge glass. Both above and below the water glass in the tail pipe was a stop valve; the upper valve being for the purpose of shutting off the connection should the gauge glass break, but during the experiments it was always open. The lower valve was simply a tail valve to control the escape of water. The tail valve was supplied with one foot of very light rubber hose (⅜ inch) which terminated in a paper pail. The water was drawn into the paper pail through the tail valve, but was always kept in sight in the glass and made to agree with a thread around the middle of the glass, both at the commencement and the end of all trials.

On the header before mentioned was arranged a steam pressure gauge, and in an oil well in the upper side of the same header was fixed a standard thermometer for the purpose of checking errors in the steam pressure gauge by comparisons with the temperature of the steam. It will be noted that the trials were generally made at 1, 5, 10, 18, and 30 pounds pressures, but that some of the circles indicating trials are on other lines, notably in the neighborhood of 5 and 10 pounds. Where the greater number of trials are shown, these differences of pressure are the results of corrections made by the thermometer, the pressure gauge being somewhat inaccurate and the pressures likely to fluctuate ½ pound, or thereabouts, as a pressure-regulating valve is only an approximate instrument for work of this kind. At the lower pressures (one to five pounds) there is very little loss due to the evaporation of the hot water as it falls into the pails, especially as the end of the hose is kept under water as much as possible. At the higher trials a small percentage of the hot water, when relieved of its pressure, is converted into steam. This is obviated in a great measure, however, by keeping the end of the hose always under water, which can be done as soon as condensation forms in the bottom of the pail and covers the mouth of the hose.

It is well to remark here that the header before spoken of, and in which steam at reduced pressures was admitted to the radiators, was also drained and kept dry by an automatic steam trap. The positions of the radiators were also changed from time to time, as it was feared that a radiator in one position might be favored over the others.



At the left of the accompanying diagram is shown the steam pressure in pounds per square inch at which various trials were made.

The next line, *A A*, gives the value in British heat-units of each pound of steam for the various pressures, and is measured from the left-hand side of the diagram, each of the squares having a value of 100 heat-units, the thermal value of a pound weight of steam being less from the higher pressures.

The curved line *B B* shows the results obtained in the radiator designated as No. 1, and they were made under conditions of very nearly equal

*Paper read at the annual convention of the American Society of Civil Engineers, June, 1894.

temperature, in a room kept constantly between 73 and 74 degrees Fahr.

Line *C C* shows results obtained for radiator marked No. 6 in the trials, which were made at the same pressures and the same temperatures as the foregoing.

Line *D D* gives the curve of condensation in the radiator marked No. 3, temperatures and pressures of steam being the same as before.

Line *E E* shows the results of experiments on radiator No. 4, which at the lower temperatures seems not to do so well. Between the 10 pound and 18 pound lines, however, the curve agrees with the remaining curves of condensation.

Line *F F* shows the other experiments made with radiator No. 3, when the temperature of the room averaged between 77 and 78 degrees. This undoubtedly accounts for the line showing the less condensation on that day. The circles 6, 1, and 3 on the 5-pound line are also results of the tests made when the temperature of the room was about 78 degrees. Other circles enclosing figures in close proximity to lines, with corresponding figures, show values obtained with the same radiator during other trials and under slightly different conditions of the temperature and humidity. They all harmonize, however, with the curves of their respective radiators and tend to confirm the results.

Line *G G* is the curve of difference of temperature between the steam and the air, and is drawn for comparison with the curves of condensation as discovered by the trials. The uniformity that exists is remarkable. There is a correction, however, to be made for the higher temperatures in the matter of the curves of condensation. As the temperature of the steam advances, the value of 1 pound of condensation becomes less, as shown in the line *A A*, so that curves of efficiency of condensation, based on the actual amount of heat lost from the radiator, and not from the number of pounds of water condensed, would all tend a little to the left as they go upward bending away from the curve of difference of temperature. It is well known that the condensation does not increase directly as the difference of temperature. These experiments, however, show that it (the difference) is not as great as was surmised, and that for all practical purposes the curve of condensation and the curve of difference of temperature is practically alike for any ranges of temperature and pressure carried in low-pressure steam heating apparatus.

Bagging of Boilers.—Gauge Glass Connections.

One of the inspectors employed by the Hartford Steam Boiler Inspection and Insurance Company recently sent to that company the following notes from the Northwest, which we find in our contemporary, The Locomotive:

The first case I want to mention relates to overheating of the furnace plates of two boilers in this vicinity. They were each sixteen feet long and 60 inches in diameter, with 44 four-inch tubes, and a manhole in the front head, under the tubes. These boilers had just been put in, and for ten days they were run very light. They were then started on the regular work, which did not by any means push them to their full capacity. They were run night and day, and their heaviest work was at night.

One morning, after they had been running on regular work for about three weeks, they were both found to be badly bagged on the bottom, directly along the front line of the bridge-wall. The bags ran clear across the boilers, and two-thirds of the way up to the water-line. The bulges were greatest at the bottom, where they amounted to about three inches. They extended forward from the bridge-wall for a distance of three or four feet, so that I estimated their area to be about sixteen square feet in each boiler. As soon as I was called on to make an inspection (about 10 A. M.), I went immediately to the boilers and found them in the condition I have described, a new bottom being required in each. One of them was still running, but the fire had been drawn from the other. I had them blow off the boiler that was out of use, so that I could see its condition, inside, just as it was, and before any washing was done. I found the bottom of the boiler heavily covered with a gummy, greasy sediment, about a quarter of an inch thick. It seemed to be organic in nature, and I concluded that it came from the radiators and piping, all of which were new. It was impossible for any water to get through it, so as to come in contact with the sheets; and the heaviest or thickest part of it was where the sheet was bagged the worst. In the rear part of the boiler, from the middle of the bridge-wall to the back head, there was a heavy coating of oil, both on the sheets and on the tubes.

It was easy to see the cause of all the trouble. The building was new, and was heated from top to bottom by exhaust steam from the engines and pumps. They had flooded the engines and pumps with oil, and this oil had been carried all through the building by the exhaust steam, and had been emptied into the boilers together with the sand and other foreign materials contained in the radiators and pipes. (Of course, there is always more or less oil and other matter in new work of this kind).

Their mistake was in not passing all the returns into the sewer for about four weeks, and in being too lavish with oil in the engines and pumps. If they had opened the boilers a couple of weeks sooner, or if they had had their boilers properly inspected, their attention would have been called to the trouble before it was too late. An inspection would have been of especial value to them, as there are many things that may give trouble in starting a new plant. These people had all the best modern appliances, including water-filters and oil separator; but these were not sufficient to prevent the accident I have described.

Another thing which I frequently notice in making calls in the way of external inspections, is the neglect of the water connections between the gauge-glass and the boiler. Every engineer is supposed to give his closest attention and care to these connections, but I find that they are sadly neglected by some of the oldest and most experienced engineers. I called at a plant a short time ago, where the engineer had had some years of experience. He had been in this plant for a year. I asked him to blow out the water glass; and after waiting some time for the water to return, I had concluded that it was not going to. Presently, however, it came in sight, and after a considerable time it came up to the proper height in the glass. I asked him to blow it out again, thoroughly; and with my watch in hand I timed its return. It took over five minutes for the water to come in sight. The connection between the boiler and the glass was of one-inch piping. I asked the engineer how large he thought the opening through this pipe was. He said he had not thought about that. It was plain that this trouble had been going on for weeks, and yet he had not discovered how long it took the water to get back into the glass, nor had he given the matter any thought or consideration. If the water only *got* back, that was sufficient. I told him the opening could not be much larger than a knitting needle, and then he began to get his thoughts together. They had an extra boiler, and the one thing on this engineer's mind, for a little while, was to get around fast enough till he could get this extra boiler ready and shut the other one off and clean out the pipe connections to the water glass. Another case, very similar to this, came under my notice recently, except that it was worse. There were *six* boilers in this battery, and four of the six were in a condition fully as bad as that I have described; yet the engineer in charge had been in this plant for years, and considered himself well up in engineering.

Another point I want to speak of is the importance of having the piping free between the *steam* gauge and the boiler. Such pipes are often long and small, with a number of elbows in them. I am frequently called upon to test steam gauges which are all right when the pipes are cleaned out.

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS.

Report of Meeting held at New York, Sept. 10.

The adjourned meeting for the formation of a society of heating and ventilating engineers which was held at the Broadway Central Hotel, New York, on Sept. 10, under temperature conditions decidedly



E. P. BATES, PRESIDENT.

uncomfortable, was nevertheless very well attended, and it is encouraging to report that the intense interest which was taken in the new movement bids fair to advance the arts and sciences of heating and ventilation, and elevate the work of the heating and ventilating engineer to a position the dignity and importance of which could not possibly be attained in any other manner.

The meeting was called to order at 3 o'clock by the chairman, Mr. Fred P. Smith, of New York, who requested Mr. Harding to take the chair for a few minutes. On assuming the chair Mr. Harding announced that Mr. Smith would address the meeting, defining the objects, advantages, and policy of the proposed organization. The subject matter of Mr. Smith's extempore address is as follows:

GENTLEMEN: The Committee has put me down for what they call an address, but I am not making addresses when the temperature is anything like this, upon the objects. advantages, and policy of the Society of Heating and Ventilating Engineers.

We are to have an association, so far as I understand it, for "the promotion of the arts and sciences connected with heating and ventilation, and to encourage good fellowship among its members." Of course there is no use in enlarging much upon these points, for we all understand what is meant by them; still I think if we were to start with that one object, and follow it out conscientiously and to the best of our knowledge and ability, we would do much toward furthering the interests of the heating and ventilating business. I think there is nothing so detrimental to the interests of this business and to the interests of heating and ventilating engineers as the lack of good fellowship among its members. I have often found it to be the case that plans suggested by one engineer would be almost certain to meet with disapprobation by another; that courtesy is not generally extended by one to another, and that it is very frequently the case to find persons praising themselves and their works and belittling their neighbors, letting it be understood that all other devices were failures and extolling the workings of their own systems.

It should be the effort of this society to overcome this feeling among the members of our profession, and by honest, hearty co-operation much could be done toward increasing our income, enhancing the dignity of our business, and elevating the work of the heating and ventilating engineer. As matters stand to-day, good fellowship is a thing unknown among that class of men who call themselves heating and ventilating engineers. No member of a society of architects should say anything derogatory of another member; no member of a society of civil engineers would in any way run down the work of his competitors. They may criticise their engineering work (that is bound to be done in any class of work), and offer plans and suggestions, but they do not go to the extent of saying that their competitors are not competent to do the work, and what applies with other societies should certainly apply with us.

Our second object is "improvement in the mechanical construction of the various appliances used for heating and ventilating." This is a matter of great importance, in my judgment. Every engineer has worked and planned for new things, and to improve upon what has been done by



W. M. MACKAY, FIRST VICE-PRESIDENT.

others in his line, and they are all looking for what we may call "a lead-pipe cinch"—to get something that is different from others and then slap a patent on it, and try to convince the public that nothing else in the world will do the work. If we permit this thing to go on it will surely work to the detriment of the profession. It is only by the united efforts of the members of the society that we may expect to attain that improvement for which we are looking. There is no reason in the world why the society cannot, if properly managed, aid us in raising a high standard of work, and regulate the price we ought to get for our work. What we want is a long, strong pull together, and that is exactly what I meant when I spoke of good fellowship.

We next come to "the maintenance of a high professional standard among heating and ventilating engineers." This does not need explanation. Of course, in the way we are working, made up as we are of a society of engineers, our members will be subdivided into many kinds of engineers. There will be the consulting engineer, who is paid for his professional services; and the contracting engineer, who receives pay for his professional services and a profit on his contract; and the manufacturing engineer, who receives pay for his professional services and a profit on all the goods he sells. We find in the field to-day several classes of incompetents standing ready to be employed in the latter capacity. Would it not be well for all who propose entering this field to prepare themselves especially for it? We can easily have a school for preparation and qualification of such persons, and attendance at such a school for proper qualification by other means should be the only means by which a man could enter upon his duties as a heating and ventilating engineer. I think this, more than anything else, would tend to a higher professional standard.

"To establish a clearly defined minimum standard of heating and ventilating for all classes of buildings." This is a very important object for our consideration. The idea is this: Massachusetts started out with a compulsory ventilation law. Most of you are aware of this fact, as architects specify "the Massachusetts standard of ventilation" in their plans, and suppose that this is absolute. As a matter of fact, there is no standard there, and whether or not there are unsatisfactory conditions in the finished work depends largely upon the inspector. They have never formulated any kind of standard. They have had it understood, however, that in schools the standard should be 30 cubic feet per pupil per minute, but farther than that they have not gone.

The lack of a definite standard for ventilation in public buildings has very often been the cause of considerable embarrassment. A man may do good work and give entire satisfaction in one district, and go over into another district and find that he is dealing with a different inspector and an entirely different set of requirements. You will see how easy it is for a man to do first-class work in one place and not come up to the requirements in another under a different inspector, who, while following out the same standard, as he understands it, has a different idea as to how it should be done. To overcome such difficulties as these, every member of our society should do his best to have a universal standard adopted, which shall be definitely known and accepted, in order



W. F. WOLFE, SECOND VICE-PRESIDENT.

that every one may be on the same footing.

You can readily see the evil of having instructions so confusing as to lead to work which may be accepted by one man and

condemned by another under the same requirements; how annoying that could be, and the necessity that standards should be uniform.

The movement is under way to have such a law passed here, and if passed it should be brought into every field where a uniform service may be required. It is desirable, also, that there should be a society to see that it is done in such a way that everybody has an equally fair show, and that the inspectors are so limited in their powers that they can judge only as to results.

Now, having adopted such a standard,



CHAS. ONDERDONK, THIRD VICE-PRESIDENT.

we will want to have all our public buildngs ventilated in accordan ce therewith. Nothing has advanced the work of ventilation in the last three years so rapidly as that rule down in Massachusetts. While architects are all well informed as to their special duties, they are not well informed as to heating and ventilation, and this fact has been brought out more prominently by the requirements of the rule in vogue in Massachusetts than by any other means. The heating and ventilating of a building should be left in the hands of a specialist just as much as should the steam and electric equipment.

"To encourage legislation favorable to the improvement of the arts of heating and ventilation, and to oppose legislation inimical to the business of the engineer." I think I have touched upon that paragraph, and it will not be necessary to add much to it.

The compulsory law in Massachusetts has created a great demand for the services of men skilled in this profession. Down here in New York the demand has not existed to such an extent, but legislation would bring the matter more prominently to the attention of architects and builders.

"The reading, discussion, and publication of professional papers, and the interchange of knowledge and experience among its members." I think it is not necessary to go into that any further at all.

Now, then, there is one other question which comes up in connection with this, while judging of the matter of policy, and which I think the society ought to establish. There are architects who think very highly of heating and ventilation, and there are others who have not taken the trouble to go into the matter very thoroughly and have not been talked to about it; and there are many civil engineers who are interested in heating and ventilation. Why not have them join with us in this society? Any man with a technical training and practical experience might be brought into the fold, with good results to all. There are many who already belong to engineering societies. The Society of Mechanical Engineers is large and strong, but ventilation has scarcely been touched upon by that society, and the interests of this profession have not been given the attention and recognition due to them. It is for that reason we are now forming the Society of Heating and Ventilating Engineers.

On resuming the chair Mr. Smith called for the reading of the names of those who had subscribed themselves as charter members of the new society, whereupon Mr. Hart, the temporary clerk, read the following list of signed members:

Adams, Henry, Supervising Architect's office, Treasury Department, Washington, D. C.
Adams, Homer, Barber & Ross, Washington, D. C.
Andrus, Newell P., 1106 Gates avenue, Brooklyn.
Blackmore, J. J., 84 Beekman street, New York.
Bates, Edw. P., Syracuse, N. Y.
Blackmore, G. C., Pittsburgh, Pa.
Blackmore, L. R., 88 John street, New York.
Barron, H. J., Cable Building, New York.
Barwick, Thos., 178 Center street, New York.
Burns, Samuel, 244 Canal street, New York.
Badger, James B., 517 Boston Building, Denver.
Carpenter, B. Harold, Wilkesbarre, Pa.
Cary, Albert A., 28 Cliff street, New York.
Carpenter, R. C., Ithaca, N. Y.
Cryer, Albert A., 85 Centre street, New York.
Cryer, T. B., 1517 Division street, Newark, N. J.
Cobb, George B., 96 Centre street, New York.
Crane, H. D., 234 W. Pearl street, Cincinnati, O.
Dean, Mark 54 Oliver street, Boston, Mass.
Douglas, Thos. J., 9 Walnut street, Norwich, Conn.
Eisert, Herman, 916 N. Gilmore street, Baltimore.
Edgar, A. C, care Model Heating Co., Philadelphia, Pa.
Foster, Frank W., 178 Devonshire street, Boston.
Fowler, A. H., 435 N. Broad street, Philadelphia.
Fish, John A., Boston, Mass.
Gormley, John, 1433 Columbia avenue, Philadelphia, Pa.
Gessert, C. F., 42 Dey street, New York.
Goodrich, Judson A., 92 Centre street, New York.
Hart, L. H., 145-146 World Building, New York.
Harding, James A., 209 Water street, New York.
Hoffman, George D., 82 Lake street, Chicago, Ill.
Hauss, Chas., Norwich, Conn.
Hibbard, John D., 75 Michigan street, Chicago, Ill.
Hill, Wm. H., 92 Center street, New York.
Hopkins, C. S., Rochester, N. Y.
Hunting, Alfed A., 618 John Hancock Building, Boston, Mass.
Jellett, Stewart A., 704 Arch street, Philadelphia.
Kidder, F. S., 249 Water street, New York.
Kinealy, J. H., Washington University, St. Louis.
Kimball R. D., Equitable Building, Boston, Mass.



L. H. HART, SECRETARY.

Longnecker, C. K., 126 Liberty street, New York, and Painted Post, N. Y.
Lincoln, Chas. C., 236 Water street, New York.
Marshall, Aquila B., 207 Water street, New York.
Mackay, James, 84 Lake street, Chicago, Ill.
Munro, Edward A., 74 Myrtle avenue, Brooklyn.
Mackay, W. M., 211 Water street, New York.
Munro, Robert, 68 Conestoga Building, Pittsburgh.
Mappett, A. S., 85 Centre street, New York.
Newton, Chas. W., 1202 W. Fayette street, Baltimore, Md.
Onderdonk, Chas. S., 520 Commerce street, Philadelphia, Pa.
Payne, John A., 230 Weybosset street, Providence.
Prather, Henry B., 203 Carolina street, Buffalo.
Petherick, John H., Chattanooga, Tenn.
Plastow, G. W., 58 Pearsall avenue, Jersey City.
Quay, D. M., Wells & Newton Co., Chicago, Ill.
Russell, Wm. A., 89 Centre street, New York.
Swetland, H. M., 145-146 World Building, New York.
Stangland, B. F., 45 Fulton street, New York.
Steel, Geo. P., 1225 Betz Building, Philadelphia.
Scollay, U. G., 74 Myrtle avenue, Brooklyn, N. Y.
Smith, F. P., 1 Madison avenue, New York.
Seward, Percival H., 94 Centre street, New York.
Stoughton, Jos. M., 78 Warburton avenue, Yonkers,
Wolfe, Wiltsie F., 43 Milk street, Boston, Mass.
Willett James R., 79 Dearborn, street, Chicago, Ill.
Wilkinson, W. B., 210 Water street, New York.
Wendover, J. R., 26 Cortlandt street, New York.
Wilson, J. J., care Fuller & Warren Co., Troy, N. Y.
Waters, T. J., Board of Education, Chicago, Ill.

The reading of these names was followed by the reading of the minutes of the previous meeting, after which the chairman appointed a committee of three to go over the constitution with the committee on organization with the idea of reporting on it later in the meeting. It was finally decided, however, to take up the constitution section by section through a committee of the whole, thus giving every one an opportunity to comment on or criticise the various sections before adoption, and obviating the delay which would be occasioned by its consideration by a conference committee.

The clerk, who was instructed to read the constitution by sections, proceeded to read section 1, as follows: The name of this society shall be The Society of Heating and Ventilating Engineers.

Mr. Harding argued for a more definite title than that of The Society, etc., as it had been suggested that other societies of heating and ventilating engineers might be in existence. He suggested The American Society, etc.

Mr. Smith expressed the opinion that as it was necessary, under the laws of the State, to be incorporated in order to hold funds, the charter would protect the title of the society and no one else could use it; therefore it would be unnecessary to amend the proposed title.

Mr. Mackay suggested that the section be amended to read The International Society, etc., inasmuch as foreigners had been invited to participate in the privileges and benefits of the association.

It was then moved by Mr. Harding and seconded by Mr. Barron that the first section be amended to read The American Society instead of The Society. Motion carried.

The clerk then proceeded to read the second section, which was adopted without discussion.

Mr. Wilkinson inquired as to the necessity of having a board of managers and a council, and suggested that the two bodies be merged into one.

Mr. Barron explained that the duties of each were fully set forth in another section, the duties of the council being to pass upon applications for membership and to recommend candidates for votes, while the board of managers would be an executive committee, as it were, and have charge of the expenditures, place of meetings. etc.

Mr. Blackmore, of New York, made the point that as the board of managers would practically have control, they would be in better shape to investigate and report on applications for membership than would the council.

Mr. Mackay explained that the object of the two committees was that the board of managers would have the handling of much of the finances, procuring rooms for meetings, and such things, to attend to, and would really have all they could do without inquiring into the eligibility of applicants for membership, and that after considerable discussion among the committee on



J. A. GOODRICH, TREASURER.

organization, it was decided to create a council to relieve the board of managers of this latter duty.

Mr. Smith stated that in the beginning

he had been in favor of but one board, but after deliberation, came to the conclusion that two were necessary. The functions of the two bodies were to be entirely different.

It was moved by Mr. Stangland and seconded by Mr. Swetland that the section be adopted as read. Motion carried.

Section 4 was then read and after some unimportant discussion adopted with a slight correction.

Section 5 was adopted as read without discussion.

After some discussion by Messrs. Jellett, Barron, Smith, Harding, and others, section 5 of article 2 was amended to read, "Honorary members shall be distinguished persons elected by the society" and article 2 as amended was adopted.

Article 3 section 1 was adopted as read, as was also section 2.

As to section 3 Mr. Blackmore of New York maintained that this section gave the secretary an opportunity of knowing how a member voted. Mr. Harding explained that the outer envelope only was marked in order to enable the secretary to determine whether or not the voter had a right to vote, and that the inner envelope containing the ballot was to be left blank and to be sealed and forwarded thus, together with all other votes, to the council. While the secretary, therefore, could easily check the member's votes, he could not tell how any individual vote was cast.

After some further discussion by Messrs. Smith, Mackay, Barron, and Harding section 3 was adopted as read, on motion of Mr. Mackay, seconded by Mr. Swetland.

After a minor change in section 4 it was adopted as amended, while section 5 was slightly amended and adopted. Section 6 was adopted as read, while section 7 was objected to in that twelve negative votes were required to defeat a candidate in his second attempt to become a member of the society, whereas but seven are required the first time.

Mr. Harding maintained that mistakes, personal dislikes, and petty spites might operate in the first instance in debarring the candidate from membership, and that after a thorough investigation and reconsideration of the application by the council it would be a hard matter to get five additional men to join the original seven to defeat the candidate. It might be possible, he said, for one or two men to influence a sufficient number to join in defeating the application on the first ballot, and through the petty jealousies of one or two a reputable man might be done an injury and the association deprived of a good member, whereas, as stated before, it would be somewhat more difficult to procure the additional five blackballs requisite to defeat the candidate on his second application.

Mr. Carpenter, Wilkesbarre, Pa., suggested that the reverse would be the rule, if, as Mr. Harding at first stated, an error had beeen made. If a man had been voted for and received seven negative votes through some mistake, some of these votes would be cast right when voting again, and the probability would be that seven negative votes would not be cast a second time. "If seven reputable, honest men (as we shall assume all our members to be) still have reasons for casting a negative vote on a second ballot, there must be some good reason for it."

Mr. Mackay called attenton to the fact that there had been a great deal of discussion on this point among the members of the committee on organization, and that some of the members thought the number of blackballs should be raised even as high as twenty-five on the second ballot in order to keep out a candidate.

Mr. Stangland's motion that this section be amended to read "The name of any rejected candidate may, after six months, etc.," was objected to by Mr. Harding, as three months is simply the minimum, and their applicaton could be presented at any time after the expiration of the three months. Mr. Blackmore, of New York, made the point that if seven men were strongly opposed to a candidate and he was brought in contrary to their wishes, over-riding of their disapproval would be conducive to ill-feeling and destroy the good fellowship which was one of the first considerations of the constitution. Attention was called to the fact that most clubs and societies consider two blackballs sufficient to keep a member out. After some further discussion, Mr. Barron moved to adopt the section as read. Motion adopted.

Section 8 was adopted as read.

After the first section of article 4 had been read Mr. Stangland raised the question as to how long the dues or assessments which are to be paid by the charter members were to extend. The sense of the meeting was that only assessments were to be made now to defray the expenses of organization and other incidentals, and that all dues would date from January 1st, 1895, but that there should be no additional initiation fees. The section was then adopted as read.

Article 5, sections 1 and 2, as well as article 6, were adopted as read.

In article 7 Mr. Stangland objected to the provision for the printing and distribution of papers intended to be read before the society.

Mr. Mackay urged the objection that they might get into the newspapers and become public property before the date of the meeting.

Mr. Hart explained that it was the custom to have papers submitted to the trade press before being read, with the understanding that the papers were not to be used until after they have been read, and should a publication violate this understanding, expressed or implied, it would forever be debarred from access to further papers or information.

Moved by Mr. Stangland and seconded by Mr. Harding that the article be adopted as read. Motion carried.

In discussing article 8 Mr. Blackmore, of New York, urged the advisability as a matter of courtesy of making the president of the society chairman of the board of managers.

Mr. Barron expressed the opinion that the president had sufficient to keep him busy without catering to the courtesy of the association or going in for a mutual admiration society.

Mr. Barron objected that it would not always be convenient for the president to be present, as he might be in Chicago, or Boston, and could not attend. Article 8 was finally adopted as read. In considering article 9 Mr. Swetland suggested that the council be given the power of investigating charges and the expulsion of members.

Mr. Mackay explained that while the council had the right of investigating and proposing applications for acceptance by the society, yet the board of managers would be more able to decide all such questions, inasmuch as they had the management of the society in their hands.

Mr. Wilkinson maintained that as the council had investigated the man's character before proposing him to the society as a candidate, all the data would be in their hands and they would be the most competent to judge.

Mr. Harding differed in that the council had merely investigated the man's professional standing and ability, the society by their vote having decided the man's desirability as a member from the standpoint of character. "It would not be from a professional standpoint or inability as an engineer that such charges would arise, but from some overt act as a man, and the question clearly comes within the domain of the board of managers." Article 9 was then adopted as read.

When article 10 was reached a question was raised as to the possibility of amending the constitution at the coming annual meeting, inasmuch as there had been no previous annual meeting. It was urged that as the society grew it might find objectionable some of the articles as now adopted, and under article 10 it would be necessary to wait until the second annual meeting before amendment could be made. After considerable discussion by Messrs. Blackmore, Barron, Harding, and others, the article was adopted as read; article 11 also being adopted.

After a slight change had been made in article 12 it was adopted as read, and on motion the entire constitution and by-laws as amended were adopted. The following is the amended constitution:

Article 1: Name, Officers, Location and Object.

Sec. 1. The name of this assooiation shall be The American Society of Heating and Ventilating Engineers.

Sec. 2. The headquarters of the society shall be located in the City of New York.

Sec. 3. The officers shall consist of a president three vice-presidents, a secretary, a treasurer, a board of managers and a council.

Sec. 4. The objects of the society shall be:

1. The promotion of the arts and sciences connected with heating and ventilation, and to encourage good fellowship among its members.
2. Improvement in the mechanical construction of the various apparatus used for heating and ventilation.
3. The maintenance of a high professional standard among heating and ventilating engineers.
4. To establish a clearly defined minimum standard of heating and ventilation for all classes of buildings.
5. To favor legislation compelling the ventilation of all public buildings in accordance with the standard of this society.
6. To encourage legislation favorable to improvement in the arts of heating and ventilation, and to oppose legislation inimical to the business of the engineer.
7. The reading, discussion, and publication of professional papers, and the interchange of knowledge and experience among its members.
8. To establish a uniform scale of prices for all professional services.

Sec. 5. Fifteen members at any meeting shall constitute a quorum.

Article 2: Membership.

Sec. 1. The society shall consist of members, honorary members, associates, and juniors.

Sec. 2. A member shall be a heating or ventilating engineer or expert, or a mechanical, civil, electrical, mining, naval, or military engineer, or an architect, who has been professionally engaged in the work of heating or ventilating for at least five years, and he shall be at the time of his admission to membership not less than twenty-seven years of age. Graduation from a school of engineering of recognized repute shall be considered as equivalent to two years of active practice. He must be qualified to design as well as to take charge and direct that branch of heating and ventilating work he has made his specialty.

Sec. 3. To be eligible as a junior the candidate must be at least twenty-three years of age, and must have been actively engaged in the work of heating and ventilating for three years, or a graduate of a technical school of recognized repute with at least one year's active practice in heating and ventilating.

Sec. 4. To be eligible as an associate the candidate must have such a knowledge of, or connection with, the applied science of heating and ventilating as to qualify him, in the opinion of the council, to co-operate with heating and ventilating engineers in the advancement of professional knowledge.

Sec. 5. Honorary members shall be distinguished persons elected by the society.

Sec. 6. All members, honorary members, juniors, and associates, shall be equally entitled to the privilege of membership, except that honorary members, juniors, and associates shall not be entitled to vote nor to hold any office in the society.

Sec. 7. Juniors and associates may become eligible for membership.

Article 3: Election of Members.

Sec. 1. Every candidate for admission to the society, excepting candidates for honorary membership, must be proposed by at least two members, or members and associates, to whom he must be personally known, and he must be seconded by two others. The proposal must be accompanied by a statement, in writing, by the candidate, of the grounds of his application for election, including an account of his professional experience, and an agreement that he will conform to the requirements of membership if elected.

Candidates for honorary membership can be proposed by the council only.

Sec. 2. All proposals to be sent to the secretary and acted upon by the council at its first meeting thereafter, when the secretary shall at once mail to each member, in the form of a letter ballot, the names of candidates recommended by the council for election.

Sec. 3. Any member entitled to vote may erase the name of any candidate upon the ballot, and will return to the secretary within thirty days of its reception such ballot, enclosed in two envelopes, the inner one to be blank and the outer one endorsed by the voter.

Sec. 4. The said blank envelopes shall be opened by the council at the first meeting thereafter, and the names of the candidates elected shall be announced at the first ensuing meeting of the society, and also in the first ensuing list of members. The names of candidates not elected shall neither be announced nor recorded in the proceedings. Candidates for honorary membership shall be proposed by the council at one annual meeting and voted for by ballot at the next annual meeting. There shall not be more than fifteen honorary members at any time.

Sec. 5. When seven votes shall be cast against any candidate, his election shall be defeated.

Sec. 6. Any person who shall be elected to membership in the society shall be promptly notified

of the fact by the secretary and he shall accept such election, subscribe to the rules of the society, and pay the initiation fee within six months afte r such notice, or the election shall be void. r

Sec. 7. The name of any rejected candidate may, after three months from date of such rejection, be presented to the council, and if reconsideration is granted, another ballot shall be ordered, at which twelve negative votes shall be required to defeat the candidate.

Sec. 8. Persons desiring to change the class of their membership shall be proposed in the same form as described for a new applicant.

ARTICLE 4: INITIATION FEES AND DUES.

Sec. 1. The initiation fees of members and associates shall be fifteen dollars and their annual dues shall be ten dollars, payable in advance. The initiation fee for juniors shall be ten dollars and their annual dues ten dollars, payable in advance. A junior, being promoted to full membership, shall pay an initiation fee of five dollars.

ARTICLE 5: BOARD OF MANAGERS AND COUNCIL.

Sec. 1. There shall be a board of managers consisting of seven members, including the president and secretary, who shall have general control of all of the affairs of the society, be trustees of same, and have power to order all expenditures and to exercise all executive functions not in conflict with the duties prescribed for the council.

Sec. 2. There shall be a council to consist of five members, who shall investigate and pass upon the eligibility of all candidates for membership, and have charge of the reading and publication of all papers.

ARTICLE 6: ANNUAL MEETING AND ELECTION OF OFFICERS.

The annual meeting of the society will be held in New York in January of each year, the date to be fixed by the board of managers sixty days in advance of the meeting. The chair will select a nominating committee, consisting of five members, whose duty it shall be to present to the meeting the names of two candidates for each position to be voted for, all voting to be by ballot, no proxies to be voted. No member shall hold more than one office at the same time, except that the president and secretary shall be members of the board of managers.

ARTICLE 7: READING OF PAPERS.

The reading of papers shall be under the supervision of the council. Papers to be read at any meeting shall be submitted to the council thirty days in advance, and shall be printed and distributed to the members one week before the meeting.

ARTICLE 8: DUTIES OF OFFICERS.

It shall be the duty of the president to preside at the meetings of the society, and to exercise a general supervision over its interests and welfare. He may call special meetings at his discretion, and shall call special meetings of the board of managers when so requested by three members, or of the society upon the written request of ten members thereof.

In the absence of the president from any meeting a vice-president shall be vested with all the powers of the president.

In the absence of the president and vice-presidents the chairman or any member of the board of managers shall be vested with their power.

The treasurer shall be charged with the custody of the funds of the society. He shall sign all checks and keep a book of record of all receipts and disbursements, making a report of same to the society at the annual meeting or when required by the board of managers,

The secretary's duties shall be defined by the board of managers. Duties not defined shall be as generally understood.

The board of managers shall elect one of their number chairman, who shall hold and exercise that office at the pleasure of the board. The council shall also elect one of their number chairman under the same conditions.

ARTICLE 9: RESIGNATIONS, EXPULSION, ETC.

Any member whose dues are paid in full can resign at any time; his resignation to be acted on at the next ensuing annual meeting.

Any member twelve months in arrears for dues shall be liable to expulsion. Any member may be expelled for conduct on his part likely, in the opinion of the society, to endanger its welfare, interests, or character; provided, however, that charges have been made to the board of managers by a member of the society, and that the board of managers have, after investigation and opportunity for defense, recommended such expulsion.

Any person ceasing to be a member of the society through resignation or otherwise, shall forfeit all right, title and interest in the property of the society.

ARTICLE 10: AMENDMENTS.

This constitution may be amended at any annual meeting of the society, the proposed amendment having been submitted in writing at the previous annual meeting. A majority vote of those present at the annual meeting shall carry the amendment.

ARTICLE 11.

The foregoing ten articles being the fundamental organic law known as the constitution, they cannot be amended or altered except as provided in article 10. The following rules known as article 12, being the by-laws, or petty, local, or minor laws, can be altered by a majority vote at any meeting, or by the board of managers at any time. Although a part of the constitution they are not a fundamental part.

BY-LAWS.

ARTICLE 12: MEETINGS AND ORDER OF BUSINESS.

In addition to the annual meeting there shall be a semi-annual meeting at places designated at the annual meeting.

Special meetings may be called as hereinbefore provided. The order of business at meetings shall be as follows, with rulings according to Cushing's Manual:

1. Roll call.
2. Reading minutes of previous meeting.
3. Report of officers.
4. Report of board of managers.
5. Report of council.
6. Reports of special committees.
7. Unfinished business.
8. New business
9. Reading of papers and discussion.
10. And at the annual meeting, election of officers, in addition to the above.
11. Strangers will be allowed to attend or address any meeting when introduced by the council.

After the appointment of a nominating committe composed of Messrs. Wilkinson, Blackmore, Jellett, Swetland and Scollay the meeting was adjourned for fifteen minutes.

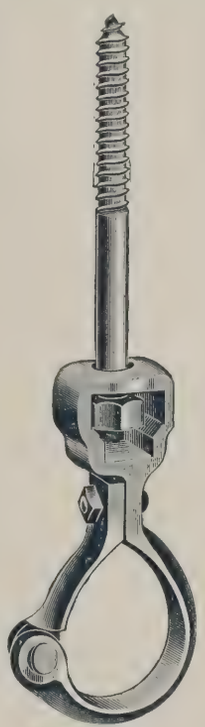
When the meeting reassembled the nominating committee reported the following nominations: President, E. P. Bates, Syracuse, N. Y., and A. A. Cary, New York; first vice-president, W. M. Mackay and Fred P. Smith, New York; second vice-president, W. F. Wolfe, Boston, and J. J. Blackmore, New York; third vice-president, T. J. Waters, Chicago, and Chas. Onderdonk, Philadelphia; treasurer, James A. Harding and Judson A. Goodrich, of New York; secretary, A. A. Cryer and L. H. Hart, of New York.

As a result of the vote on these nominations the following officers were elected: president, E. P. Bates, Syracuse, N. Y.; first vice-president, W. M. Mackay, New York; second vice-president, W. F. Wolfe, Boston; third vice-president, Chas. Onderdonk, Philadelphia; treasurer, Judson A. Goodrich, New York; secretary, L. H. Hart, New York.

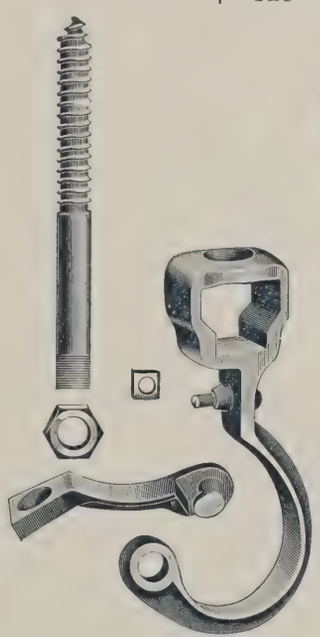
The vote on the names presented by the nominating committee for the board of managers resulted in the selection of Fred P. Smith, A. A. Cary, H. J. Barron, and James A. Harding, of New York, and Henry Adams, of Washington.

The council consists of C. W. Newton, Baltimore; R. C. Carpenter, Ithica, N. Y.; F. W. Foster, Boston; U. G. Scollay, Brooklyn, and A. A. Cryer, New York.

On motion, duly carried, it was decided to call a meeting of the board of managers and council at the Broadway Central Hotel, on Monday, Sept. 17, at 2.30 P. M. The meeting was then adjourned.



No. 1 Closed, for wooden beams.



No. 1 Open and in parts.



No. 2 Closed, for iron beams.

Bundy Giant Pipe Hanger.

Three special feature of this hanger, which has been covered by patents, is the socket in the stirrup or hanger proper that receives the hexagon nut when the stirrup is raised up for that purpose, when the No. 1 hanger may be screwed to place in a wooden beam gimlet fashion. The upper end of the screw terminates in a gimlet point and has coarse wood-screw threads, while the other end has standard pipe threads, so that the bolt may be lengthened out if desired with ordinary pipe and a coupling, which is always available on a steam job.

After the wood-screw has been set to place, or the No. 2 hanger affixed to an iron beam, it may be slightly lowered by partially unscrewing the hexagon nut, using the socket in the stirrup for engaging the nut as above described and rotating it with the hand.

The stirrup or hanger proper swings in any direction, for which purpose there is ample space provided above the nut socket. The swinging movement is further favored by having the upper side of the hexagon nut and the part with which it comes in contact oval or dome shape, making available the advantages of ball bearing connections. The hinge, or small movable part of the stirrup, cannot be removed while at its highest or lowest point of elevation or depression, but may be detached while at an intermediate point. When closed it engages the sloping surface in surrounding the bolt, which is cast solid the hanger, and locks it when the bolt is screwed up. This also pulls the movable part up tight at the hinge, so that both sides of the pear-shaped stirrup sustains equally the weight of the pipe suspended, and also prevents any rattling of the hanger in case of vibration of the building or piping.

The horizontal clamp in the No. 2 hanger, which engage the iron beam, is adjusted to fit tightly any size of beam, thereby preventing any play or looseness of this part. The weight falls equally on all of the parts and in a vertical line. No bolts are used for holding these clamps to the iron beam.

When the movable part of the hanger is open it stands horizontally and forms a concave bracket on which the pipe to be suspended may, if desired, find a place of rest a little to one side of its final or normal resting place. A line of these hangers may be put up, graded to secure the proper drainage of the pipe to be suspended, by the use of a small pipe and spirit level, and the pipe afterward be set to place through the opening made by leaving the hinged part open. A. A. Griffing Iron Co., Jersey City, N. J., manufacturers.

A raising of the evaporation from 6½ to 7 pounds of water per pound of coal represents the saving of about 7 per cent of the coal bill, which would warrant the incurrence of an expenditure for improvements equal to one whole year's coal bill.

NEW SPECIALTIES.

VULCAN GAS HEATER.

The accompanying illustrations show the Vulcan hot air furnace, Fig. 1, and the Vulcan hot water heater, Fig. 2, designed to use gas solely for fuel, which are being put on the market by William M. Crane & Co., 838 Broadway, New York, the well-known manufacturers of gas appliances. They are constructed entirely of cast iron, which, it is claimed, insures their durability, as it will stand the corrosive action of the sulphur compounds that are often found in natural gas, and occasionally in illuminating gas. The hot air heater, Fig. 1, consists of a central round brick-lined flue, with the gas burner in the base. This flue extends to the top of the furnace, connecting directly with the centre of the dome. The dome is cast in one piece, without joints or bolts, and has air slots through it from bottom to top that extend from its outside to its centre. Ten vertical corrugated tubes connect the dome with a circular hollow outlet ring that has an outlet for the products of cumbustion. The whole is encased in the usual galvanized iron casing. There is an opening, with damper, from the dome connected with the pipe to the chimney that is used only when lighting the gas to start the draft up the chimney when it has not been used for some time, and prevent accumulation of gas in the furnace. The gas burner is constructed so as to intimately mix the gas and air, using, it is said, the least amount of air necessary to effect the complete combustion of gas. The combustion is completed in the hot fire-brick lined chamber, and the highly heated products ascend directly to the top of the furnace' imparting little of their heat until they reach the dome. This highly heated column of gases makes a strong forced draft sufficient to draw in the air needed for the combustion, to force the products into the open air. The products of combustion pass through the dome between the air slots, and thence down the corrugated side tubes, and as cooled, descend to the outlet ring, and pass into a pipe directly to the open air, or to a chimney, as preferred. A large part of the aqueous vapor resulting from the combustion of the hydrogen in the gas is condensed in the lower part of the corrugated tubes and outlet ring and passes out through the small pipe to the cellar drain or to a vessel, as preferred.

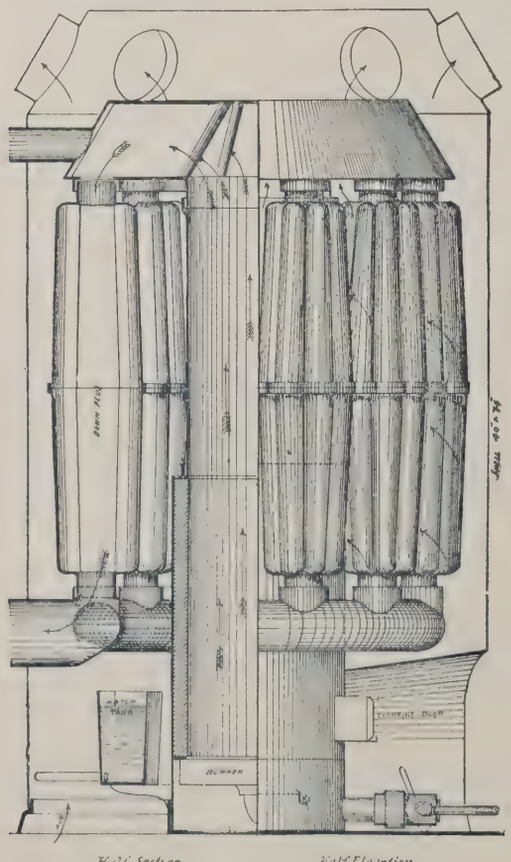


FIG. 1.—VULCAN HOT AIR FURNACE.

The hot water heater, Fig. 2, is constructed on the same general principles as the hot air furnace. The products of combustion ascend through a highly heated brick-lined flue, impinging directly on the bottom of the dome, then descending through the sections to the outlet below the lower section. The return water passes through the two lower sections of the dome, which has the supply outlet in its centre. In this, as in the hot air heater, the products of combustion are subjected to the lowest temperature in the heater as they pass out. The only water joints are in the columns outside of the heater, always in sight and easily made. The sections are alike, and the size of heater can be changed by increasing or decreasing the number of sections.

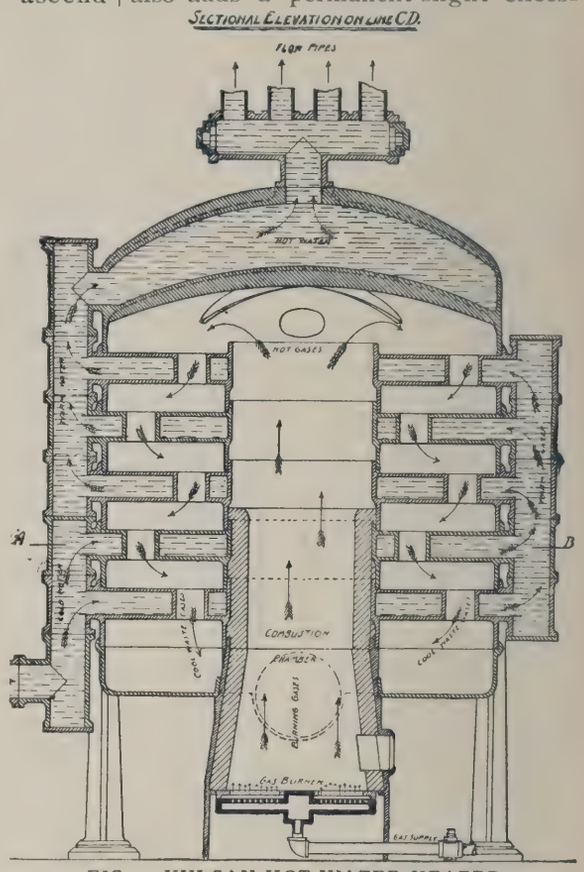
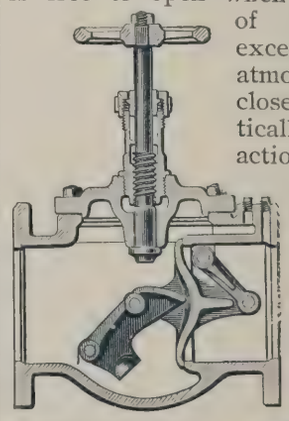


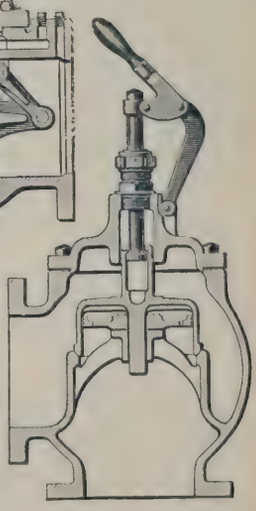
FIG. 2—VULCAN HOT WATER HEATER.

SCHUTTE CHECK VALVE AND EXHAUST VALVE.

The two devices illustrated herewith are manufactured by L. Schutte & Co., Twelfth and Thompson streets, Philadelphia. The action of the balanced horizontal check valve will be easily understood. The inclined suspension bar to the left has a tendency to open the valve, while the inclined supporting bar to the right has an equal tendency to close it. A small counterweight on the supporting bar compensates for a possible deviation from the level position of the valve and also adds a permanent slight excess of force to close it. A boss is provided at the right for the convenient attachment of a vacuum breaker or air admission valve. There are two passages, as shown, one leading to the condenser side and one to the engine side, corresponding to passages in the vacuum breaker. The automatic free exhaust valve, when attached to the exhaust pipe between the engine and the condenser is free to open when the pressure of the exhaust exceeds that of the atmosphere, and closes automatically when the action of the condenser produces a partial vacuum in the exhaust pipe. It is made in two forms, with downward discharge, to be placed direct in the line of pipe; and the form shown in the cut, to make connection to a tee branch of the exhaust pipe.



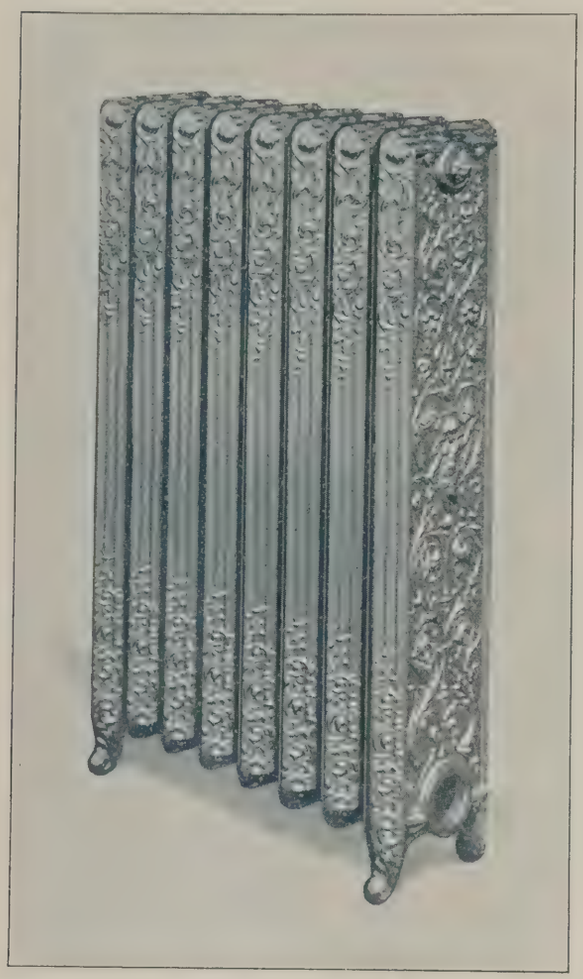
CHECK VALVE.



EXHAUST VALVE.

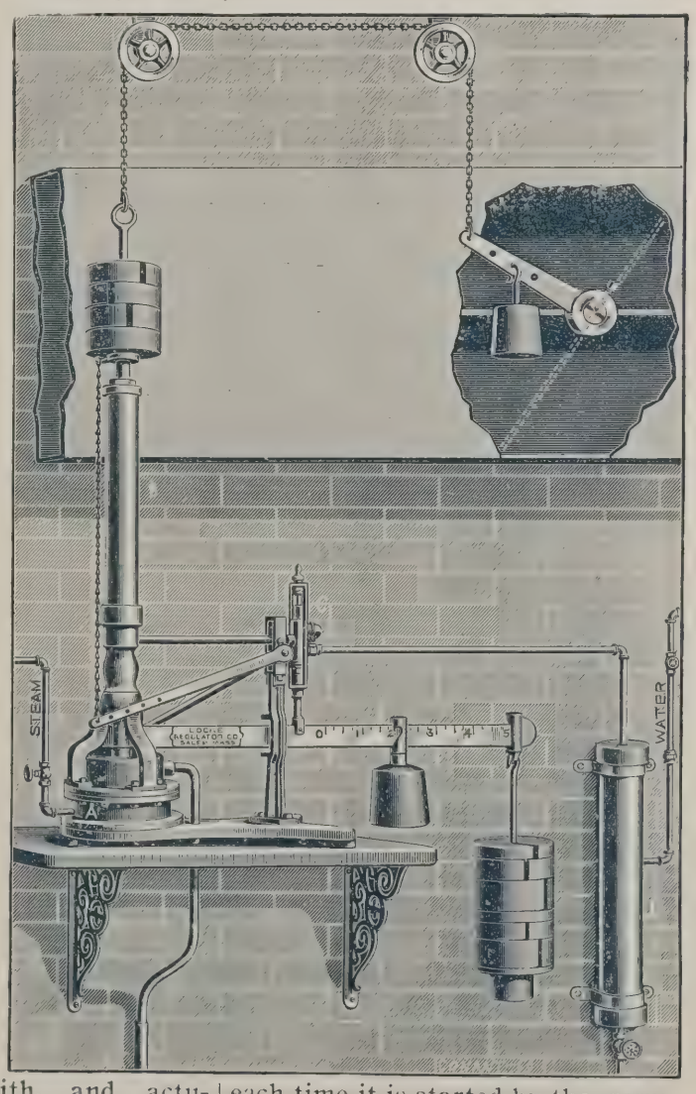
DETROIT FLUE RENAISSANCE RADIATOR.

The accompanying cut shows a new radiator just brought out by the American Radiator Co. of New York and Chicago. The makers claim to have abolished all forms of extended surface in the new radiator, and say that for this reason it will be superior to other makes. The height of this radiator is 38 inches, the width being 8½ inches. Each loop contains 7 square feet of all-cored, prime heating surface, and occupies 3 inches, when estimating length of radiator. For hot water this radiator is connected with right and left solid metal screwed nipples at top and bottom, without the use of bolts or packing, and for steam in the same manner, with single connection at the bottom.



LOCKE GAUGE TESTING HYDRAULIC DAMPER REGULATOR.

We understand that the regulator shown in this cut is considered the first successful attempt to construct a regulator of this class, in which the diaphragm and lever, called the "steam weighing device," is no longer required to operate the damper, but simply moves a small valve for the admission of fluid to a powerful motor capable of handling any number of heavy dampers, thereby rendering the friction and resistance of the damper of no account in the matter of hindering the operation of the regulator. Experiments were commenced as far back as 1875, which resulted in bringing out the present Locke regulator in its present perfected form. It seems that Locke was the first to discover the need of some fluid outside of the steam boilers for operating the damper regulator, and the application of cold water under pressure seems to be a vital element in a regulator of this kind, as the steam or even the water from the boiler soon corrodes the valve and prevents the operation of the regulator. The sensitiveness and very close working of this regulator is secured by attaching the valve to the lever of the regulator, giving it a greatly multiplied motion, so that only a slight spring of the piston steam weigher is required to accomplish all that is necessary in the way of opening and closing the dampers. It is claimed that it is impossible to make a damper regulator which would have any commercial value compared with the Locke without directly infringing some of the claims of the several patents which have been granted on this regulator, and it would be well for parties contemplating building regulators to examine these patents. In the accompanying cut *A* represents a steam chamber connected by a ⅜-inch pipe with any steam pipe carrying full boiler pressure; *B* a water motor utilized in controlling the damper, mechanical stoker, or forced draught, separately or combined as may be required; *C* a water valve, regulating the supply of water used in the motor *B*. The stem of this valve is connected with, and actuated by, the graduated scale beam *E*. Any rise of pressure above that for which the regulator is set will raise this beam, admitting water to the motor, lifting the weights and closing or partially closing the damper. Any fall in the steam pressure is followed by a corresponding fall of the scale beam, closing the inlet pipe to the motor *B* and opening the outlet, lowering the weights and opening or partially opening the damper. *D* is a receiver, or mud drum, used to allow any sediment which may be in the water to settle. The water supplied to the motor *B* should be cold, and may be taken from any convenient pipe carrying not less than 20 pounds pressure. Motor *B* is of a size to suit the pressure of water. *E* is a graduated scale beam by which the machine can be set quickly and accurately to any desired pressure, and will always be found a reliable and positive test on the gauges. There is no diaphragm in the steam chamber *A*, a flexible rubber disk being used, which is always covered with cold water, keeping the machine sensitive and efficient. A cam is operated near the valve by means of a lever and chain attachment to water motor *B* by which the motor is prevented from being carried too far, and the damper is held partially open and only allowed to move a short distance each time it is started by the regulator. The Locke Regulater Co., Salem, Mass., are the manufacturers.



TUERK'S CHANGEABLE BLADE VENTILATING FAN.

The accompanying cut shows the working principle of this fan so clearly that an extended description is unnecessary. As shown, a large gear meshes into eight smaller gears with one of which each fan blade holder is connected. To change the angle of the blades all that is necessary is to loosen the set screws and shift one of the blades to the angle desired, all the rest moving correctly in the same direction; then tighten the set screws to prevent shifting. As the blades can be set to drive the air in either direction, it is never necessary to run cross belts. The fan is made in thirteen sizes, with capacities ranging from

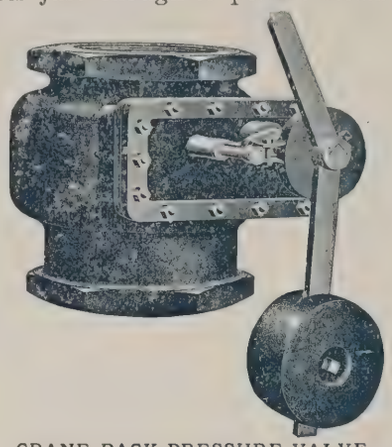


TUERK'S VENTILATING FAN.

6,000 to 150,000 cubic feet of air per minute. Tuerk Water Meter Co., Fulton, N. Y., are the manufacturers.

CRANE'S NOISELESS BACK PRESSURE VALVE.

The piston of the back pressure valve shown in the engravings (made by the Crane Co., Chicago), is provided with ports around its sides with a combined area 30 per cent greater than that of the pipe. The piston is connected to the shaft and lever by a shaft being set to one side of the center line, the link lever stands at an angle to the vertical, while the weight arm hangs vertically. This permits the valve to rise when pressure is brought against its under side, opening the ports just enough to permit steam to

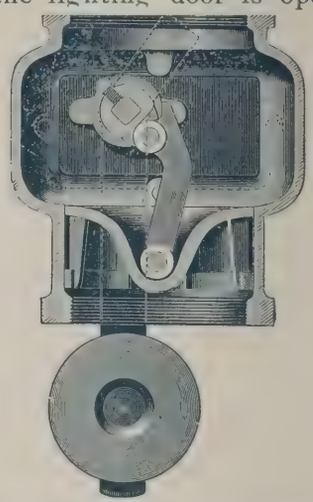


CRANE BACK PRESSURE VALVE.

escape while at the same time maintaining the pressure for which the value is set. It will be seen from the arrangement of parts that as an increase in pressure lifts the piston, the weighted arm is carried farther from the vertical, so that its increased leverage, as it approaches a horizontal position, exactly counterbalances the increased pressure on the piston; and as the latter does not close against a seat, there can be no noise or pounding.

ENTERPRISE GAS RADIATORS.

The two new gas radiators which are shown in the accompanying illustrations are being manufactured by Luther & Lederhos, 30 Cliff street, New York. Fig. 1 shows a radiator with horizontal heat tubes, supported by columns resting on a nickle plated base. In the bottom of the base a planished copper reflector is placed, over which is suspended a burner of the illuminating character, which is lighted through placed in both columns so that the products of combustion leave the base and pass up one column to the partition, which deflects their course through the heating tubes back and forth until the top is reached, where they find exit through an opening adapted for a chimney connection when desired. This radiator is designed for a base heater, and in operation, a strong, radiant heat is given off near the floor, and a good current of hot air rises through the ornamental top, after having passed over the heating tubes. Fig. 2 shows a radiator with vertical heating tubes running from the top to a base constructed with the same style of burner and planished copper reflector. To facilitate the lighting of this radiator a hood connected with the lighting door is opened;

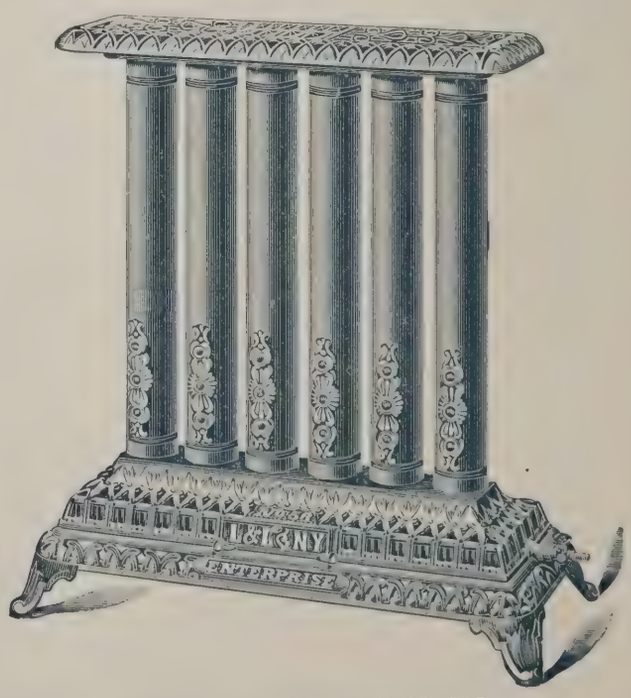


CRANE BACK PRESSURE VALVE SECTION.

then when the gas is turned on it is collected, and all the burners light at one time. The columns connect into an ornamental top and are decorated with colored jewels in nickeled settings. Both radiators are made in three sizes, with four, five, and six heating tubes, burning 25, 30,



ENTERPRISE GAS RADIATOR.—FIG. 1.



ENTERPRISE GAS RADIATOR—FIG. 2.

curved link, as shown in the section, and moves freely in the valve casing, to which it is accurately fitted. The

a door at the centre of the base. The column at one side is not open at the bottom, and partitions are

and 35 feet of gas per hour respectively, and said to have the capacity to heat rooms from 15 to 18 ft. square.

SUPERB REGISTER.

The accompanying illustration shows design No. 4, Superb register, made by Rives & Co., Rochester, N. Y. It is made in five sizes

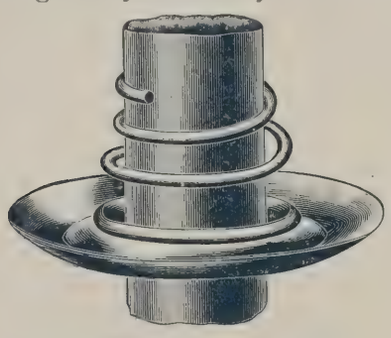


SUPERB REGISTER.

of the best quality of material. Besides the Superb, the above named company manufacture a large assortment of floor and wall registers in a great variety of sizes and original designs.

COLUMBIA CEILING PLATE.

The ceiling plate shown by the accompanying illustration is placed on the riser before putting it up and when the riser is in place the spring and plate is shoved up to the ceiling, and before the floor above is laid the top spiral is pulled up, stretching the spring, so that the plate hugs the ceiling closely and always remains in

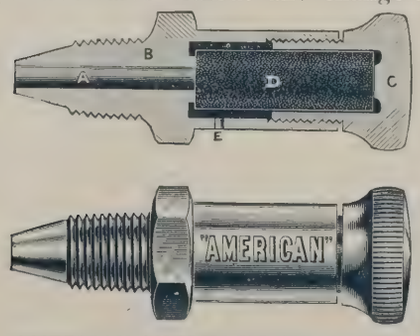


COLUMBIA CEILING PLATE.

place. The J. W. Chamberlain Co., Bangor, Me., are the manufacturers.

AMERICAN AUTOMATIC AIR VALVE.

The American positive and automatic air valve, illustrated herewith, is a new departure in air valves, as it can be used either as an automatic or positive valve without any change or

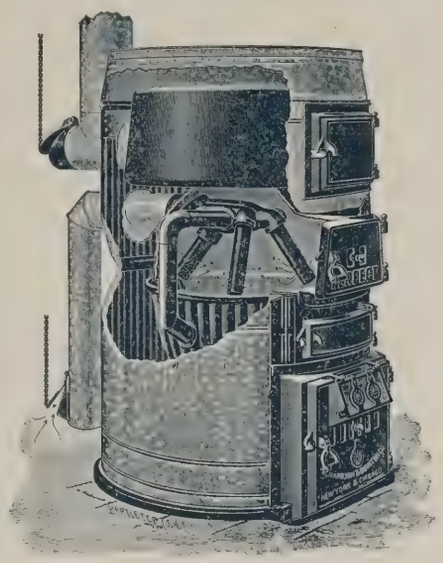


AMERICAN AUTOMATIC AIR VALVE.

adjustment whatever. The socket of the operating piece is of sufficient depth to keep the expansible valve stem in perfect alignment with the valve seat, and the expansible valve stem may be adjusted lengthwise without turning the valve seat. In this air valve the expansible valve stem is made of a specially prepared composition, so that when the valve cools and the stem contracts it allows the admission of air into the radiator and prevents the formation of a vacuum. The Pierce, Butler & Pierce Mfg. Co., of Syracuse, N. Y., are the exclusive manufacturers.

PERFECT HOT-AIR BLAST FURNACE.

The accompanying illustrations show a new smokeless furnace for



PERFECT HOT-AIR BLAST FURNACE.—FIG. 1.

burning soft coal, just brought out by the Richardson & Boynton Co., 232-234 Water street, New York, who claim that their method of providing what they term a down-draft hot-air blast, insures the perfect combustion of soft coal. Fig. 1 shows the interior of the furnace and the position of the hot-air-blast heating chamber, the supply of air for which is taken from the cellar through the six-inch pipe shown at the rear of the furnace, thus, incidentally, efficiently ventilating the cellar. In describing the action of the furnace, the manufacturers state that the hot air from the hot-air-blast heating chamber is distributed in jets close to the surface of the burning fuel, and it is also carried down to and below the surface of the fire, entering the fire pot on each side midway between the grate and the top of the fire pot. They say that the distribution of the hot-air-blast draft, both above and below the surface of the fire, gives a blow-pipe effect, producing a bright, clear flame, consuming smoke and gases, coking the fuel quickly, giving an even fire and requiring no more attention than burning hard coal. Fig. 2 is a side view of the hot-air-blast heating chamber which

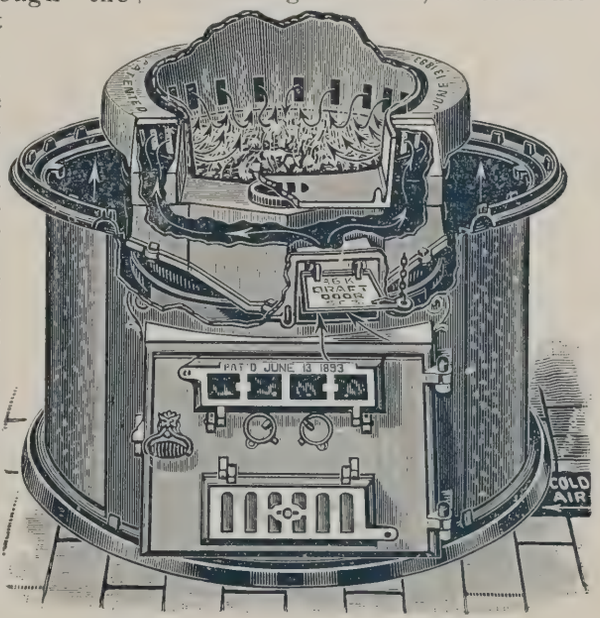


PERFECT HOT-AIR BLAST FURNACE—FIG. 2.

is located inside the combustion chamber as shown in Fig. 1.

KERNAN SMOKE CONSUMER.

The accompanying broken sectional view shows the principle upon which this furnace works, a current of heated air entering the fire-pot over the fire, igniting and consuming the smoke from soft coal, for burning which the furnace is designed. When starting the fire the lift damper on the smoke pipe, and also the check panel in door and the slide in the ash pit door are closed, and the draft door, immediately below the feed door, is opened. The manufacturers state that the lift door or slide on ash-pit door should rarely, if ever, be opened. The coal is placed on the grate first and the shavings or kindling on top, the fire being started at the top of the fire-pot instead of at the bottom. The furnace is provided with a self-cleaning, anti-clinker, rotating bar, dumping grate, the bars of which are so constructed that air passes between and reaches the center of each. The grate bars are supported in a readily removable grate frame, so construct-



KERNAN SMOKE CONSUMER FURNACE.

ed as to give each bar a center support. The Kernan Furnace Co., Utica, N. Y., are the manufacturers.

Heating and Ventilation

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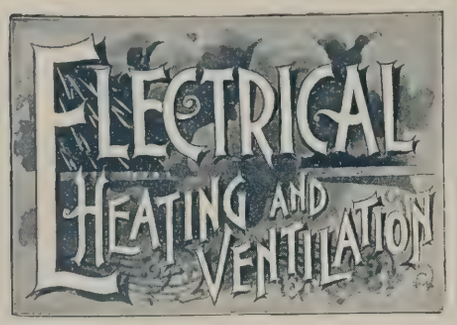
The entire contents of each number are copyrighted; but the press everywhere is cordially invited to make extracts of matter not expressly marked as reserved the sole condition being that proper credit shall be given.

ELSEWHERE in this issue will be found an account of the formation of the American Society of Heating and Ventilating Engineers, a new organization which promises to advance the arts and sciences of heating and ventilation with great rapidity and with much benefit to humanity. The formation of this society marks the beginning of a distinct era of progress; and decided improvement in the mechanical construction of heating and ventilating apparatus may be confidently looked for. The encouragement of good fellowship, the diffusion of knowledge on scientific and practical problems, and the establishment of a uniform scale of prices for professional services are objects the attainment of which will be of incalculable benefit not only to members of the society but to the profession at large.

THE test of steam-pipe coverings on pages 6 and 7, leads to the conclusion that it costs $15.40 to run one hundred feet of naked two-inch pipe at from 70 to 80 pounds pressure for one year of 3,000 working hours, with coal at $2 per ton. With the least efficient of the coverings used in the test this loss could be reduced to $4, with the most efficient to $2.64. Striking as are these figures they are probably below the cost of actual practice, for steam pipe is under pressure usually more than ten hours a day, and $2 per ton is below the average cost of coal. Prof. Charles B. Gibson, in some tests made for the Manufacturers' Mutual Insurance Company some years since, reached the conclusion that with coal at $4 per ton and 3,000 working hours per year, the loss from a naked two-inch pipe was 64½ cents per linear foot, considerably more than Mr. Dickinson's test would show even with coal at $4 per ton. However, the lowest of the estimates shows the importance of covering the pipes and it is a good thing to attend to before the present loss is increased by the coming cold weather.

ONE of the little things which is bound to pay its way in a steam plant of any magnitude, is a valve reseating machine. In the first place it makes a great reduction in the loss of leakage, a loss which becomes very considerable when in addition to the heat units discharged by the escaping fluid is added the destruction of pipe coverings, corrosion, and deterioration of the surrounding work which is apt to result from a neglected leak. If the valve can be repaired in situ, it will be attended to promptly. If it must be taken out, an opportunity must be awaited when the engineer has time for an extended and perhaps difficult job, and the system can be shut off long enough to permit of its being done. Again, there is the saving of the time of the engineer or pipe-fitter, usually overtime at an increased rate of payment; and finally there is the saving in valves, fittings, and coverings, for usually some of these will be sacrificed in taking down the piping necessary to get a valve out, a new valve will be put in to save time, and the leaky one will find its way to the scrap heap.

IN selecting a boiler the layman or manufacturer who has paid but ordinary attention to this feature of his business is at a decided disadvantage. Upon information more or less reliable he has made up his mind that he wants a certain horse-power. A boiler produces steam, not power. With a given amount of steam one engine will produce four or five horse-power, where another would produce one. Engineers have simplified the matter for themselves by adopting a certain amount of water evaporated into steam under given conditions per hour as the unit of a boilers' capacity, but our layman knows nothing of this, and cannot be expected to master all the complexities of equivalent evaporations, etc. Even if he did, the amount of water which a given boiler will evaporate will be widely different under different conditions. Some will advise him to buy twice as much boiler as he needs and just let them barely stew. Others will tell him that he can get better economy with a smaller investment by burning his fuel briskly, and parsimony may lead him to carry this advice to the extent of buying too little boiler surface and forcing it disastrously. In considering the claims of the various applicants for his patronage, it will be well for him to look well into what each man is offering for his money. One may offer him a horse-power for ten dollars, where another wants eighteen. But perhaps the cheaper man has only eight square feet of heating surface to a horse-power, where the other man has fifteen. Suppose the heating surface to be equally efficient and the boilers equally desirable in other respects, how much does he gain by patronizing the cheaper man? Perhaps the low-priced boiler will produce a horse-power with eight feet; many will, and with less, but the other would do proportionately more, and the man who has been generous in his rating is placed at an apparent disadvantage. Remember that wide differences in price must be made up in proportionate differences in other directions, capacity, quality, or somewhere, and these differences are hard to discover. Inferior material, slack workmanship, and unscientific design are apparent to the layman only after numerous repair bills have brought them very pointedly to his attention. The boiler is one part of the plant on which it is not well to pinch too closely in first cost. Aside from the bare cost of repairs the losses from interruptions may greatly exceed the difference between a cheap, insufficient, and unreliable conglomeration of iron and a scientifically designed apparatus, which will give you good service year after year without being a constant drag upon your pocket-book, a hindrance to the continuous operation of your factory, and a menace to the lives of yourself and all about you.



Heating by Hot Wire Resistance.

BY AUSTIN S. HATCH.

In heating by any method the first question presenting itself is, the expansion of air for different temperatures and consequently the relative spaces required for the cold and heated air. The second question is, what will be the temperature of air passing over a heated body of a given temperature, and consequently its velocity?

Of course the first depends on the result of the second. The accompanying diagram shows the temperature measured under the varying conditions. The temperature was taken with the thermometer held one foot above the heater. Curve No. 1 is produced from a steam coil. Curve 2 is the temperature of air on a horizontal coil heater without any regulation to the ingress of the air. No. 3 is from a heater supplied with dampers. No. 4 is the ideal line and would be secured by keeping the velocity of air constant, which is 17.1 feet per second. The double curve of No. 1 is caused by a vertical and horizontal coil respectively. Curve 2 is from an electric coil with top and bottom open made by stretching wires between two parallel boards. Curve 3 is from a heater with dampers to cold air inlet. The same number of watt hours were used in both curves 2 and 3.

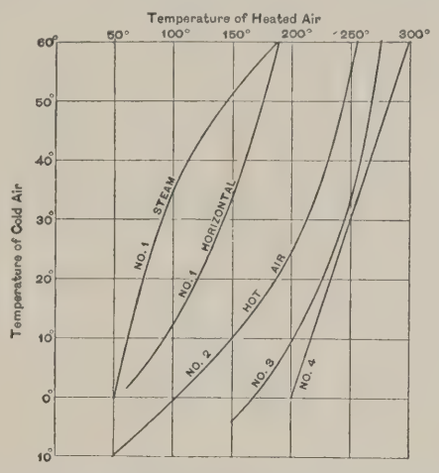
With these curves as a guide I built two electric heaters requiring 1½ amperes at 500 volts, placing them in an electric car at Windsor, Ont. I finally placed heaters in all the cars there, two of which ran 18 hours per day, and the following is the readings from one of them;

Temperature outside.	Temperature inside. Lowest.	Watt-hours used during 18 hours run.
8° to 10°	48°	16,035
11° to 4°	47°	16,324
—2° to 6°	41°	21,246
21° to 25°	60°	13,004

This is not the record of the two 750 watt heaters but of four 500 watt heaters, placed in one car. It is a lower record than the 750 watts would give, although the two 750 watt heaters take less current than the four 500 watts. The air space is so much larger for the 500 watts that they would heat the air more rapidly and could be shut off sooner. These low results are obtained by my method of regulating the air instead of the electricity to the heater, as the air, not the resistance of the wire, is the variable.

I also used these heaters in my house, heating four rooms, about 7,000 cubic feet. The temperature was nearly constant at 65 degrees F., varying only 2 or 3 degrees above or below. These heaters consumed about 30 kilo watt hours per day, which at one cent per kilo watt hour would be $9 per month. To heat these rooms with coal it would have taken about 1⅓ tons in a stove or 1½ in a furnace. This makes electric heating equal to coal at from $6 to $7 per ton at the above price. In street car work the cost of heating cars, that is, sixteen-foot cars, is from one to two cents per hour of service, at the rate as given at the convention in Milwaukee, that is, nine-tenths of a cent per kilowatt hour.

The electric heaters, I may add, as designed by the writer, consist of a coil of wire wound on an open insulated frame. Two or more of these frames are placed horizontally in proper cases so that the amount of cold air admitted can be regu-



lated. The temperature of the wire is carried to from 300 degrees to 350 degrees F.—Electrical Engineer.

New Electrical Heating Apparatus.

Mr. H. Ward Leonard, president of the Carpenter Enamel Rheostat Co., has just had issued to him a patent for an electric heater which, it is claimed, is likely to mark a very distinct advance in electrical heating apparatus. The invention is said to be quite radical, the patent obtained by him containing very broad claims, the first of which is as follows: "A device in which electric energy is converted into heat, having a thinly insulated conductor embedded in and completely surrounded by a *closely* applied mass of metal substantially as set forth."

The principal point of difference between this and other electrical heating apparatus is the thinness of the insulation and the consequent close proximity of the surrounding heat conducting metal to the conductor. In many electrically heated tools, the conductor is surrounded by a considerable thickness of fireproof insulation such as asbestos, mica, fireclay, etc., all of which are extremely bad conductors of heat; therefore, if the thickness of the wall of such insulation be considerable, the heat developed in the resistance is conducted but slowly through this bad conductor, and is very important for the operation of electric soldering irons, flat irons, embossing irons, and many other similar tools, that the heat developed in the resistance shall be conducted to the working surface as rapidly as possible, and with the least amount of waste. While the conductivity for heat through such insulation is greatly increased by means of a strong mechanical pressure, no thoroughly successful results have thus been obtained Mr. Leonard has many modifications of the general principles of his invention, but the description of one modification will give a general idea of the invention. The resistance, which is a metal wire, is thinly coated with fireproof insulation, such as enamel or glass which seals the conductor from the air. The conductor so insulated is placed in a mould, and metal is cast about the insulated resistance so as to completely embed it. This surrounding body of metal as it cools subjects the insulated conductor to strong pressure, insuring perfect mechanical contact throughout. The surrounding metal also hermetically seals the resistance from any possible contact with the air, and from all chemical action. While the insulation surrounding the conductor is of comparatively poor quality, as a conductor of heat, the wall of this insulation is so thin that it affords little resistance to the flux of heat from the heated resistance of the surrounding metal body, and consequently the temperature of the heated resistance and the temperature at the surface of use will be as nearly the same as possible, and the resistance is, therefore, not subjected to a temperature appreciably higher than that of the surface of use. It is claimed to be possible to operate tools heated by the Leonard system at a bright red heat without any destructive effect whatever.

Among the various kinds of apparatus which will soon be on the market, due to this invention, are soldering irons and embossing irons, flat irons and tailors' gooses, cooking utensils, such as chafing dishes, broilers, etc., griddle cake bakers, coffee pots, electric stoves, electric ovens, egg boilers and many applications to small appliances, such as curling irons, sealing wax heaters, etc. Also all kinds of atmospheric heaters such as street car heaters, and heaters for dwellings where the cost of electric current is sufficiently low to make it possible for electric heating to compete with fuel directly. In this regard Mr. Leonard estimates that where power can be had which does not cost more per horse-power per annum than the cost of two tons of good coal, electric heating can compete on the score of economy alone with heat from fuel direct, and the many advantages of electric heaters are so pronounced that they will frequently be applied for atmospheric heating even though the actual direct cost be much greater than that due to heating by fuel.

LETTERS FROM PRACTICAL MEN.

Correspondence from practical men upon topics of interest relating to Heating, Ventilating, and kindred subjects, will find a place in this department. The editors, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

English Practice in Heating and Ventilation.

I crave for a small space in your valuable paper to reply to Mr. Barron's criticism published in your issue of July 15th. I wish at the outset to thank Mr. Barron for his homely and kindly criticism of my paper read before the Master Steam and Hot Water Fitters' Association Convention, and I should just like to point out that it was quite a slip on my part in omitting Sir Douglas Galton's name amongst those whom I considered pioneers of better heating and ventilation.

My object in stating in my paper that a "revolution" in heating and ventilation in England took place ten years ago, was to show or indicate to the minds of my American hearers that the old forms of "box coils" and large pipes were doomed, and that steam heating superseded hot water for large plants to a great extent. I apologize for omitting Sir Douglas Galton's name in my paper, and wish to add that I would be the last man to treat this honored name with the least apparent slight. D. M. Nesbit.

Hottest Part of a Boiler.

In the May issue H. Temp presents the questions: "Where is the hottest part of a boiler? Is it within the bed of burning coals, or in the gases of combustion outside the bed of coals?" In reply to these questions I would say that in a common heating stove the fire pot is the first part to get red hot and the balance of the stove will last to burn out a number of fire pots. As this would indicate that the hottest part of the stove is the fire pot, so with anthracite coal the hottest part of a furnace is the fire pot. When a blacksmith wants to make a weld he puts his iron *into* the fire, and not over it, as the hottest point is within the bed of coals. With bituminous coal or wood the hottest parts are *over* the fire in the flame. A. W.

Boiler Explosions.

I consider an always reliably working safety valve as a real stronghold of security against boiler explosions. I always insist that such a valve be opened once every evening before quitting work, to ascertain whether it is in order or not. I insist also on blowing off every evening about one-eighth of a gauge of water, and to do that under low pressure and with safety valve partly open. This insures a very serviceable commotion in the water, which brings sediment up from the still hot floor of the boiler and thus prevents to a large extent the clogging up of the blow-off pipe. Under my hands an explosion has never occurred, and I do not feel warranted to act on theories, meanwhile neglecting, perhaps, the simplest common sense precautions. F. L.

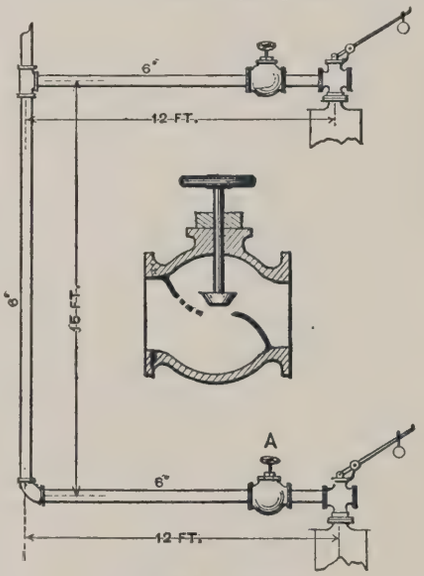
Leaky Boiler Tubes.

I have been in the heating business about thirty years, but I have recently had an experience such as I never had before and am at a loss to account for it. I have found much information in your valuable journal and have thought perhaps your readers could give me some information in regard to this matter. A year ago I put in two tubular boilers, each 12 feet long. This summer I put in another boiler at the same place, and on turning on the water to test the work after putting in the third boiler, we found a leaky tube in one of the boilers put in last summer. We had a new tube put in, and on turning on the water again found four more leaky tubes. We had them replaced, and on again turning on the water found fourteen leaky tubes. We then concluded that it would not do to risk the boilers another winter, and had all new tubes put in. We have had the water suggested as the cause, but they use Missouri River water, and they have another boiler at the same place which has been in use many years with the same kind of water and is now in good condition, so that cannot be the cause. I am satisfied that the boilers have had good care. There has never been above 185 degrees of heat, and not over 22 pounds pressure. The job is an open gravity pressure water heating job. Any information which your readers could give me in regard to the cause of the leakage would be greatly appreciated.

Steam Fitter.

Valve Accident.

With your permission, and for the benefit of your many readers, I would be pleased to have the following circumstances published in your columns. My reason for wishing to give the matter publicity is that it may have a tendency to stop the dangerous habit some firemen and engineers have of entering one of a battery of boilers for the purpose of cleaning or repairs while maintaining a steam pressure on the others, depending solely and entirely on a main steam valve on top of the boiler to remain tight while they are inside. The accompanying rough sketch and description of a broken valve, at the large spring works of



VALVE ACCIDENT.

D. W. Shuler & Sons, of Amsterdam, N. Y., will no doubt cause a cold chill to pervade the anatomy of the average boiler tender who thus risks his life.

On Sunday the attending engineer inspected the interior of one of the boilers, which had been blown down and left to cool off over Saturday. He simply closed off the main valve on this particular boiler, while the others carried their usual pressure. He came out safe, as Providence, no doubt, had reserved him for a better fate. On the next day, Monday, this main valve, which had been left closed (as there was no fire under this particular boiler), suddenly gave way, thereby opening up full communication with the other boilers, which were in operation. The first intimation the engineer had was the engine slowing down and the steam whistle on the cut-out boiler blowing.

On examination as to the cause of the trouble, it was found that the interior partition of the main steam valve on the cut-out boiler had an irregularly formed piece broken out. This piece was about 3½ inches the longest way, and about 2 inches the widest way. It is an ordinary iron body brass mounted globe valve, with yoke, and had been in use five or six years. The brass seat was found to be all right, and the valve sound in every particular excepting the broken piece mentioned, which is indicated by the dotted part. Amsterdam.

Wasteful Use of Exhaust Steam.

The letter from Jay M. Whitham in the August issue deserves a passing notice, for while it was evidently intended to show that it does not pay to use exhaust steam for heating purposes, it really has no bearing on the subject whatever. I have no doubt that his tests were carefully made, but they prove only one thing, and that is that it requires more coal to run an engine with a heavy load than it does with a light one, and I was convinced of that before I read his letter.

He has made a mistake in stating the case, for he says: "During each test the work done was the same," etc. In one of these tests the back pressure was ten pounds more than in the other, consequently the forward pressure must have been increased by the same amount, and the load on the engine was increased in direct proportion.

Let us see what this proportion is. His mean effective pressure was about forty pounds, and the increase of the forward pressure was ten pounds, therefore $10 \div 40 = .25$ or 25 per cent. In short he makes a test with a certain load on his engine, and then increases this load by 25 per cent and makes another test, when he finds that his coal consumption is increased by nearly 25 per cent, which is a very reasonable conclusion to arrive at. Now if he had demonstrated that where it cost $1 to heat with this exhaust steam, it would have cost but 75 cents to use live steam, we should have gained some information on the subject, but as it is he appears to have missed the point altogether. In a majority of cases where it is expensive to use exhaust steam for heating purposes, it is due to a poorly-designed system of piping, which it will be profitable to remodel.

W. H. Wakeman.

Boiler Feeding.

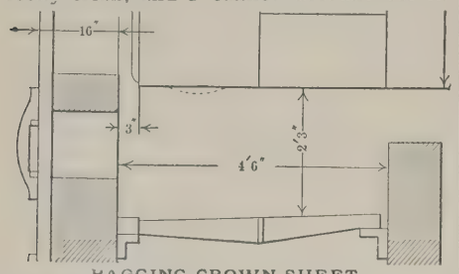
It is my opinion that it does not matter much where the water enters a boiler, as long as it is as hot, or nearly so, as the water within the boiler; otherwise it makes a great difference. I had charge of a boiler that was fed in at the back end. As long as the engine was running the water entered the boiler at 180 degrees, but as soon as it stopped there was no way of heating it, so any water entering the boiler after working was cold. Owing to this boiler being too small, to prevent it from foaming, the water had to be kept at a very low level from 4 to 6 o'clock, when more steam was required than duirng the first of the day. The result was I had to put cold water into it as soon as we shut down, so that it would be all right for the watchman getting up steam in the morning. I have felt the front of the boiler at the bottom, and it was just as cold as the incoming water. A fall of 280 degrees in ten minutes I thought was not very good for a boiler, still it did not explode.

That this way of feeding may be the cause of boiler explosions I think I can prove. Some eight years ago I had charge of eighteen boilers in batteries of three each. The water was fed in at the bottom through a water leg in the first sheet at the back. The heaters at this place consisted of two old boilers into which the main engines exhausted. From Saturday at noon till Monday morning these engines were not running. During this time we had to feed cold water, as there were no injectors. There was not two weeks passed that some one of these eighteen boilers did not crack the sheet right in front of the water leg. The water naturally flowed towards the front of the boiler, and the part of the sheet behind the leg never did crack. This became such a nuisance, seeing it caused us to blow off three boilers (as there was only one steam valve for three boilers), tha we decided to put the feed in at the top, and from that day till the place shut down some years after there never was another cracked plate, proving that the manner of feeding had everything to do with it.

Alpha.

Bagging Crown Sheet.

Inclosed please find a tracing of a boiler. I have had continual trouble with my crown sheet at the place dotted. It will pull down or bag about one-half or three-quarters of an inch. The boiler is kept perfectly clean, and I cannot account for it.



BAGGING CROWN SHEET.

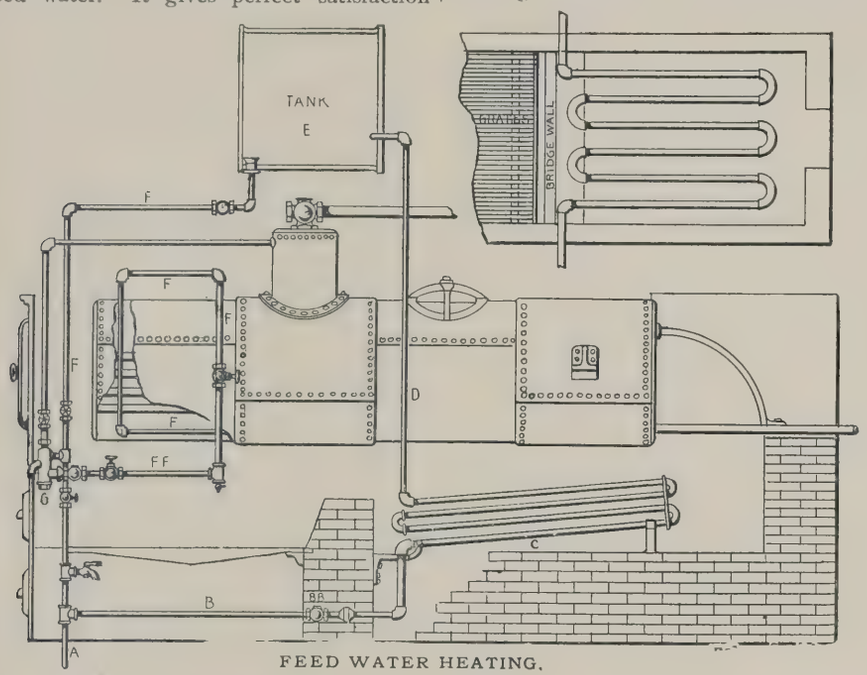
The first row of flues is 8 inches from the shell, and the plates are 5-16 of an inch thick. I use Chicago river water, which, of course, needs no recommendation. What do your readers think is the cause?

Hermann Ehrlich.

Feed Water Heating.

I inclose a drawing of an arrangement I have had in use for a long time for heating feed water. It gives perfect satisfaction and uses no extra fuel. In the sketch, *A* is the connection with the city mains, connecting with the injector and with the supply pipe *B*; *B B* is a check valve. The feed water flows through *B* to a series of coils *C*, and from *C* through pipe *D* to tank *E*, whence it is forced by pump or injector through pipe *F* to the boiler. The coil *C* is placed just back of and on a level with the bridge wall, as shown, or it may be arranged as in the upper view. By increasing or diminishing the number of coils, any desired degree of heat may be imparted to the feed. I have had no trouble with this method of heating feed water. If the coil were placed in the hood or uptake it would interfere with the draft.

Geo. S. Kelb.



FEED WATER HEATING.

Second-Hand Boiler Experience.

I have in mind a second-hand boiler experience an acquaintance of mine has just had, which may be of interest to your readers.

The boiler in question is a small upright used for heating purposes, and was bought this season of a second-hand dealer and warranted all right. When the boiler arrived on the premises where it was to be used, I was called in to see what a big bargain they had got, and as my opinion was asked for, I looked the boiler over. I found the shell and heads in fair condition, but the tubes were all used up, the tops of nearly all being burned off close to the head, and the inside was badly scaled, and appeared to be worn down very thin. I gave as my opinion that they would have any amount of trouble with that boiler before spring, and advised them to put in a few more dollars and get a new one. But as it had been tested, and was warranted to be all right, they went ahead and set it up.

After about one month's run it leaked slightly about the tubes; in about a month more it leaked so badly it troubled them some to keep any fire. It went on in this way for a while, they being in hopes all this time that it would "heal up," as they said, when one good cold day she was steaming rather hard, and they thought perhaps it would steam easier if the tubes were scraped out. So they got down the scraper and went at it (this was the first time they had cleaned the tubes). All went well enough until when, in one of the middle tubes, about two-thirds of the way down, the scraper cut clear through the tube, letting the hot water run all over the cellar. There was but very little steam on at the time, so no other damage was done.

This all happened on a good cold day, and there was no other way to heat the building except a few small stoves, which had to be set up. The man who had warranted the boiler was sent for, and after a thorough examination he decided that the only way to fix it would be to put in an entire new set of tubes, which has been done. This left the building practically without heat for three days in midwinter.

Commercial Horse Power of a Boiler.

The commercial horse-power of a boiler is now considered as the evaporation of 30 pounds of water, with temperature of feed at 100 degrees and gauge pressure at 70 pounds, or an equivalent of 34.46 pounds "from and at 212 degrees." The horse-power for any other temperature of feed and gauge pressure is found by reducing to the equivalent "from and at 212 degrees," multiplying by pounds of water evaporated per hour, and dividing by 34.46. The rule for relative evaporation "from and at 212 degrees" is: Rule: To 1,216 add $4\frac{1}{3}\sqrt{g}$ times the square root of the gauge pressure; from the sum subtract 1.04 times the temperature of the feed, and cut off three figures from the remainder.

$$\text{Formula: } \frac{1216 + 4\frac{1}{3}\sqrt{g} - 1.04\,T}{1000}$$

This multiplied by pounds of water evaporated per hour, and divided by 34.46, gives the commercial horse-power of the boiler. We can simplify this process by dividing by 34.46 first, and we shall have this rule for commercial horse-power of boiler for any number of pounds of water evaporated per hour at any temperature of feed and at any gauge pressure: Rule: To 35.25 add $\frac{1}{8}$ the square root of the gauge pressure, from the sum subtract .03 of the temperature of the feed, multiply the remainder by pounds of water evaporated per hour, and cut off three figures from the right of the product.

$$\text{Formula: } \frac{P(35.25 + \frac{1}{8}\sqrt{g}) - .03\,T}{1000}$$

The actual horse-power of the water used as steam without expansion is equal to the gauge pressure multiplied by the pounds evaporated per hour, divided by 13,750, multiplied by the weight of one cubic foot of steam at the gauge pressure; or, to find the horse-power of the water used without expansion:

Rule: To 82.1 add the square root of the gauge pressure, multiply the sum by the gauge pressure, and by pounds of water evaporated per hour, divide the product by 42,930 plus 2,888 times the gauge pressure.

$$\text{Formula: } \frac{g\,P(82.1 + \sqrt{g})}{42{,}930 + 2{,}888g}$$

Expansion increases the power of the steam up to a certain point, but there comes a time when it ceases to be a virtue, depending upon the initial and back pressures. Thus, steam at 70 pounds gauge pressure and feed at 100 degrees temperature must have a relative expansion of one-third to equal the commercial horse-power. The maximum power expanding against a back pressure of 14.7 pounds, or expanding into the air, is with a relative expansion of 5.71, when its power is 54.76 horse-power for every 1,000 pounds evaporated per hour. Expanded further than this, the power falls rapidly. The least gauge pressure, expanding or exhausting against an air pressure, that will develop a commercial horse-power is 24.5, with a relative expansion of 2.63, the temperature of the feed being 212 degrees. The commercial horse-power in this case is 29.51 for every 1,000 pounds of water evaporated per hour. These rules agree within a very small fraction of one per cent of close calculations from standard tables.

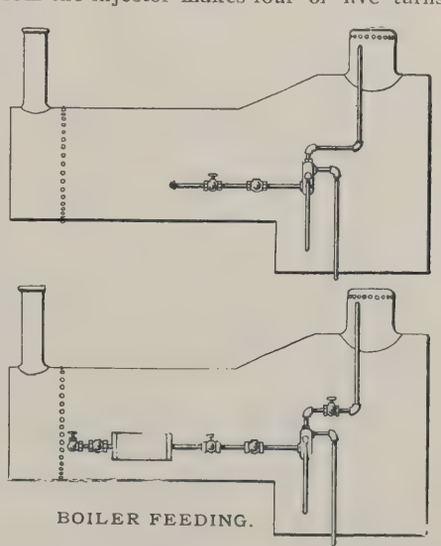
N. J. Smith.

Boiler Feeding.

My boiler injector is fitted as shown in the upper part of the accompanying skeches, and I do not think it is a good plan, for three reasons. First, it feeds into the hot shell; second, the piping from injector to boiler is too short, so that the action of the water under pressure in the boiler when the injector is not in use is apt to make the check valve leak; third, the injector is apt to get too hot when not in use.

I think the plan shown in the lower sketch is better. There are two check valves, one near the inlet to the boiler, to keep hot water out of the pipe. The pipe from the injector makes four or five turns through a short heater, and contains enough water at all times to prevent the injector from heating. Which plan do your readers think preferable?

Caspar.



BOILER FEEDING.

NEWS AND NOTES.

LARGE BUILDINGS.

New York City.—The old New York Hotel site is about to be improved. School Commissioner Guggenheimer, who has control of the property, says he intends to erect four 12-story office buildings on the hotel site, so connected as to make one building. A ten-story, fire-proof structure is in process of construction at 144 to 150 West Broadway for the wool exchange by the New York Warehouse Company; cost, $1,000,000. Pearl street, southwest corner of Beekman street, by John Pettit, of Bennet Building, 17-story brick and iron building; cost $400,000. Plans have recently been completed for the erection in New York of a medical missionary institute, where young men and women desirous of becoming missionaries may receive a medical education. The institute is to be connected with the International Medical Missionary Society. The new building is to cost about $250,000. James E. Ware, architect, has drawn plans for an eight-story brick warehouse building, 57 by 95, at No. 213-215 and 217 West Forty-sixth street; Mary P. Winterbottom, of No. 209 West Fifty-seventh street, owner, to cost $90,000. Messrs. Lederle & Co., architects, have drawn plans for a six-story brick storage warehouse building, 108 by 50, on Columbus avenue, 29 feet north of 107th street; Messrs. Bernheimer & Schmidt, of Columbus avenue and 108th streets, owners; to cost $80,000. Joseph Fahys, of 54 Maiden Lane and 29 Liberty street, will erect a 13-story office building, to cost $80,000. Morris R. Jackson is preparing plans for a ten-story brick warehouse with granite front, 46 by 74 feet, at Nos. 538 and 540 Washington street. The owners are James B. and W. S. Pyle; cost, $72,000. Warner Van Norden treasurer of the Board of Trustees of the Presbytery of New York, has filed plans for a six-story cast iron front warehouse, 15 and 17 Green street, to cost $65,000. Edward Judson will erect a new seven-story brick warehouse at Houston street, No. 69 West, to cost $30,000. Herman P. Ahrens, of 49 Franklin street, will erect a seven-story brick office building, Elm street, northwest corner of Franklin, to cost $60,000.

Chicago.—J. M. Van Osdel, 825-225 Dearborn street, has prepared plans for the alterations and two additional stories to the Commercial Hotel, at Lake and Dearborn streets, for C. W. Dabbles-see; steam heat, electric lights; estimated cost, $50,000. Jackson Park-Board of South Park, Commissioners, D. H. Burnnam & Co., 1147 Rookery, architects. Plans have been submitted to the board for consideration. Cost $135.000, one story high, stone base; steam heat, glass roof, electric lighting, gas fixtures, plumbing, cement work. Corner of Sixteenth and Arthur streets, Felix & Marston, Michigan avenue, near Randolph street, owners: E. B. Abbott, 225 Dearborn street, architects; mason work let; cost $75,000; 113 by 172, five stories high, brick, stone, stone trimmings, architectural and galvanized iron work, three freight elevators, electric lighting, fire proofing, gas engines. 362-67 Illinois street, Chicago Dock & Canal Co. 210-34 Clark street, owners and architects; mason work let, cost $50,000, 150 by 160, six stories high, brick, stone, pressed brick, stone trimmings, freight elevator, fire protection, fire-escapes.

Philadelphia.—Plans for the $150,000 club building for the students of the University of Pennsylvania are being prepared. The building will be erected alongside of College Hall. The building throughout will be furnished in hard wood and will have all modern improvements. Frank Miles Day is preparing the plans.

Boston.—A large addition to the Hotel Austerfield, on Beacon street and Massachusetts avenue, is to be erected. It will be six stories, built of brick and brownstone, and will cost about $25,000.

Brooklyn.—Application has been made at the building department for a permit for the erection of the German Hospital on the south side of St. Nicholas avenue, between Stanhope and Stockholm streets, to cost $212,700. The lot is 200 by 250. It will be four stories high; the front will be of brick, Greenwich stone and terra-cotta, to be fire-proof; R. L. Daus, architect.

Buffalo.—Hill Bros. have sold to Capt. Alexander R. Clark for the Parmelee estate the property, 30 by 100 feet, with four-story brick block, at the northwest corner of Main and Perry streets. The adjoining property, 40 by 100 feet, will be bought from John B. Manning, and it is understood that a 10-story office building will be erected there. The estate of James P. White has decided to go on with the erection of the proposed Red Jacket block at the southwest corner of Main and Allen streets, which was the last enterprise undertaken by the late James P. White. The building will be composed of stores and flats and will cost $45.000.

Reading, Pa.—The contract has been let for a House of the Good Shepherd, to cost $175,000. John Flynn, of Philadelphia, is the architect. The building will be five stories high, 155 feet long and 142 feet wide.

Albany, N. Y.—The Hon. George Bush, chairman of the Building Committee of the Eastern New York Reformatory, which the last legislature provided should be established at Warwarsing, Ulster county, submitted to the State Board of Charities plans for the erection of the buildings. They embrace a greater and lesser plan. The greater plan to cost $543,000. The lesser plan to cost $410,000. These plans were approved by the State Board of Charities and by Superintendent Perry, of the Capitol Construction Department. Construction work will commence in October.

Saginaw, Mich.—St. Vincent's Orphan Home, owners; James R. Walsh, architect; cost, $30,000; three stories, 126 by 104, brick, stone, steam heat, galvnaized iron, slate roof, hardwood finish, electric lighting, ventilating, boilers, steam pipe covering.

Fairbault, Minn.—Harry W. Jones, of Minneapolis, has prepared plans for a city hall and library building; estimated cost, $30,000. Bids will be received immediately. The building will be nearly completed this fall.

Cleveland, O.—Huron Street Hospital, C. W. Hopkinson, 50 Euclid avenue, architect; cost, $20,000; six stories high, brick, stone trimmings, galvanized iron work, iron shutters, undecided heat, iron work, grates, kitchen outfit, laundry fixtures, gas fixtures, plumbing, boilers, steam pipe, covering, carpets.

Auburn, Cal.—Bids were called for to be opened October 19 for the heating and ventilating of the new court house building. Also bids for heating and ventilating cell jail, in accordance with plans and specifications of M. J. Curtis.

Saginaw, Mich.—The general plans for the new contagious disease hospital were approved by the staff of the Saginaw hospital and the committee appointed by the Y. P. S. C. E. The best facilities for heating and ventilating and sewerage are designed.

Sheridan, Wyo.—The H. F. Cady Co., of Omaha, have made a proposition to erect a $20,000 building at Sheridan, to be used by the county for a period of five years, at a yearly rental of $2,000. The building will contain fire-proof vaults. The proposition has been accepted by the county commissioners.

Lowell, Mass.—Mr. Amasa Pratt was elected last week one of the directors of the Squirrel Island Association. It is intended by the association to build on the island a hotel, three stories high. It will cost about $20.000.

Memphis, Tenn.—The Continental National Bank will commence September 1 the erection of a $50,000 bank building; C. F. M. Niles, cashier.

New Orleans.—The board of directors of the St. Charles Hotel announce that they have made arrangements for the erection of a new hotel in place of the one burned last April. It will be seven stories high, and will cost $1.000,000 to $1,500,000.

Cohoes, N. Y.—The recently appointed hospital commission organized by the election of D. J. Johnston, president, and F. H. Foster, secretary. The commissioners intend to erect a new hospital building at a cost of about $20,000, at once.

Delaware, O.—Dr. Charles E. Slocum, of Defiance, will erect a $50,000 library building at the Ohio Wesleyan University.

Galveston, Tex.—The building committee of the Protestant and Israelitish Orphans' Home, will receive bids for the erection of a two-story brick orphanage. Estimated cost, $30,000; I. Lovenberg, Chairman.

Liberty, N. Y.—Lindsly & Co., of Middletown, have received the contract to build the large hotel at Liberty for J. W. Lancaster & Co. of Long Island City. It will cost about $100,000.

Stamford, N. Y.—A hotel will be erected which will cost about $25,000.

West Hartford, Conn.—Barrett Brothers have been awarded the contract for building St. Mary's Home for the Aged, on Albany avenue in West Hartford. The building will be three stories high and have one wing. John J. Dwyer is the architect. Cost, $100,000.

Malden, Mass.—The specifications for the new Y. M. C. A. building, to be erected on the Lakeman lot, corner of Pleasant street and Linden avenue, call for a four-story brick building to cost about $60 000.

Leavenworth, Kas.—Wallace W. Waits has been granted a permit to remodel the old Planter House, at a cost of $27,000. Work has already commenced.

Niagara Falls, Ont.—A new hotel company with a capital stock of $60,000 has had letters patent granted to it in Canada. It is proposed to build a modern hostelry. James Barry, W. L. Doran, Alex. Logan, F. McKenzie, Anderson and H. C. Symmes are interested

Des Moines, Iowa.—The stockholders of the Savery Hotel Co. have decided to erect a new building to be used as a kitchen, laundry, and to contain the heating plant for the Savery Hotel. Other improvements are contemplated. The probable outlay will be $50,000. W. W. Wismer, is president of the Savery Hotel Co.

Pittsburg, Pa.—W. W. Howland, of Chicago, took out a permit for a nine-story stone, brick, iron and terra-cotta business block at 817 Penn avenue, to cost $31,000.

Boone, Iowa.—Plans have been prepared by J. P. Eisentrant for the erection of a $28,000 opera house. Martin Sollhorn is promoter of the enterprise. It is expected that work of construction will soon commence.

Richmond, Ind.—The plans of Oscar Cobb & Co., of Chicago, Ill., have been accepted for the erection of a $100.000 club house for the Commercial Club. Steam heat, electric light, elevator, etc.

SCHOOLS AND COLLEGES.

New York City.—The Board appropriated a large sum of money for additions to and improvements of the public schools, divided as follows: For heating and ventilating Primary School No. 27, $75,549. Alterations to heating apparatus of various schools, $3,270. Heating Grammar School No. 56, $5,977. Building an addition to Grammar School No. 4, $22,150. For building an addition to Grammar School No. 87, $52,292. For addition to Grammar School No. 61, $18.500. New school building for Grammar School No. 66 at Kingsbridge, $96,850. For additional cost of lots for school house site in East 88th street, $2,417. For heating addition to Grammar School 54, $3,211. Heating and ventilating apparatus for new school at 81st street and Avenue A, $28,578. For a new school building at Fox, Simpson and 167th streets, $37,500. Addition to Grammar School No. 19, $4,153. For improving new lot for Grammar School No. 51, $8.500. The application of the Board of Education for $7,400 for heating the hall of the Board was laid over. A new university building will be erected on the site of the old university of the City of New York, on Washington Square. It will consist of 10 stories, beside basement and sub-cellars, and will occupy the entire front of Washington Square, east, between Washington and Waverly places. Building will be fire-proof, white limestone for the two lower stories, and white brick and terra cotta from there to the top. Plans are being prepared for a school building at Madison avenue and 119th street.

Philadelphia.—Ground was broken by Contractor Geo. L. Harvey for the three-story brick and stone school house to be erected at the southwest corner of 13th and Norris streets. Building is to cost $61,-000. At a meeting of City Council, Mr. Hicks authorized the erection of a new school house at 54th street and Lansdowne avenue and appropriated $85,000 for it.

Chicago.—1.007 Seminary avenue, August Fiedler, 77 City Hall, architect, taking bids, cost $50,000; 40 by 124, three stories high, brick, stone, pressed brick, stone trimmings, steam heat, school fixtures, furniture, boilers, ventilators. A new school will be erected on Page and 53d streets, to contain 17 rooms. Also an addition to the Hawthorne School building, located on N W. corner of School street and Seminary avenue. Architect, August Fiedler. Committee on Buildings and Grounds.

Allegheny, Pa.—The Allegheny Fifth Ward school board will establish during the coming year a manual training department. Plans for an additional building to be used for this purpose are now in the hands of the architect. The cost of the building and equipment will be about $10,000. A new school building will be erected to replace the old one on North avenue. Estimaed cost, $80,000.

Elk Point, S. D.—Bids for the construction of a school house in District No. 15 will be received by the undersigned on or before Sept. 22. Dave Walters, Clerk of District No. 15. P. O. Address, Elk Point, S. D.

Berea, O.—Cramer & Fugman' of Cleveland, have prepared plans for a $40,000 building to be erected by the German Wallace College, Berea stone, Spanish tile roof, heating and ventilating, assembly hall with stage, gymnasium, etc. Rev. Wm. Nash, president.

Wilmington, Del.—The building committee of the board of education held a meeting and after discussing the question of the new No. 9 School, accepted the plans of Architect E. L. Rice and instructed him to prepare plans and specifications for the builders and contractors. Eight room school building, three stories high, of buff brick and stone trimmings. Located at 8th and Wollaston streets, and to cost $25,000. The new building commitee was authorized to advertise for bids for the heating apparatus for the new No. 9 School.

Washington, D. C.—Ground will be broken early in the fall for the first building of the American University at Washington, otherwise known as the "Methodist" University. The original plan for Administration Hall, as the building will be called, provided for a structure of bluestone or granite two stories and a half high, 25 feet in length, 87 feet deep in the wings, and 100 feet in the centre. The cost is estimated at $200,000.

Atlanta, Ga.—The board of education decided to accept plans and design of Messrs. Golucke & Stewart for the Boys' High School; located on the corner of Gilmore and Courtland streets. It will be 4 stories high, 14 rooms and office for superintendant library, chemical apparatus. W. F. Slaton, Supt.

Harriman, Tenn.—Plans and specifications are being prepared for the erection of a proposed university. Estimated cost, $200,000. Address W. B. Winslow.

Appleton, Wis.—A new public school building is to be erected in the Third Ward at Appleton to cost $30,000.

Lowell, Mass.—Lowell will erect a new stone school building to be located on Billings street; architects, Stickney & Austin. Another school building will be located on Middlesex street; architect, H. P. Graves. Plans and specifications may be seen at superintendent's office. R. Bray, Supt.

Detroit, Mich.—Military avenue board of education, D. Wallace, secretary, Malcomson & Higginbotham, 53 Moffat building, architects, contract not let, cost $30,000, 143 by 76, two stories high, brick, stone trimmings, electric work, grates, hardwood finish, electric bells, plumbing, school fixtures, and furniture.

White Plains, N. Y.—School district No. 1 is to erect a new school at a cost of $36,000.

Niagara Falls, N. Y.—A new school house will be built at the northern end of the city.

Watertown, Mass.—A contract has been awarded to Johnson Bros., of Brookline, to build a new school house in Watertown at a cost of $34,500, that being the amount of their bid. The new structure will be erected on the lot of land adjoining the High School building, and it is to be 2½ stories high. There is to be a large workshop for manual training in the basement.

Parkville, Conn.—The fathers of the La Salette mission have decided to build a college in Parkville for the education of young priests for the French Mission. The fathers, whose present home is in the old episcopal residence on the corner of Woodland and Collins streets, have had plans for their new building prepared by architect Michael Donohue, of this city. The college will have a frontage of 113 feet on New Park avenue. It depth on Grace street will be 44 feet. In the basement there will be steam-heating apparatus and storerooms.

Paterson, N. J.—It was resolved that a committee of two be appointed by the president to select an annex to be used in conjunction with school No. 5. Resolution adopted.

Woonsocket, R. I.—Henry L. Cook, L. L. Chilson, J. S. Read, the building committee for the new Boydon street school house, requested an additional appropriation of $2,000 to enable them to put in a modern system of heat and ventilation, referred to committee on education.

New Haven, Conn.—About 40 of the several thousand voters in the Centre School district attended the meeting on Thursday and voted a $20,000 addition to the Washington street school.

Bath, N. Y.—The plans for the new school house at Bath have been turned over to the committee of 20. The work, it is estimated, will cost about $22,500.

Yonkers, N. Y.—The board of education has approved plans for a new school building in District No. 10 at the corner of Prospect and Clinton streets.

Greeley, Colo.—The new high school building to be erected at a cost of $25,000, will contain a gymnasium and will be heated by hot water.

Rockville, Conn.—Contractor J. O. Sullivan began work on the new St. Bernard's parochial school building. The building will occupy the Cogswell lot on Park street. All the heating, ventilation, and sanitary apparatus will be of the latest pattern. Building will probably be finished this year, and when completed will cost $35,000.

Washington, D. C.—The Oblate Sisters of 8th street between C. &. D. streets southeast, will commence the erection of a new school house on Aug. 15. The structure is to cost $14,000.

Watertown, Wis.—C. G. Maybury & Sons, of Winona, Minn., are preparing plans for building the Lutheran University, recently burned. Estimated cost of new building, $40,000. E. A. Ernst, president.

La Porte, Ind.—Wing & Wahurm, of Fort Wayne, have prepared plans for a $200,000 school building to be erected at La Porte.

MILLS AND FACTORIES.

Brooklyn, N. Y.—T. A. Korrigan, at 9 Willoughby street, will erect a four-story brick factory 68.5 by 4. 11¼ by 10.1, Broadway & Lexington avenue; corner; cost, $21,000.

Cleveland O.—Broadway Mills Co., owner, John Richardson, 204 Superior street, cost, $20,000. Three freight elevators, boilers, engines, flouring machinery, steam dumps, office fixtures, safe, etc.

Benning, D. C.—The extensive plant of the Washington Abattoir Company, which was recently destroyed by fire, will be rebuilt at once. The cost of the new buildings will be at least $29,000. The plans are prepared. William L. Patterson, architect. The building will be of brick, two stories, covering ground surface 172 by 50 feet.

Middletown, Conn. —J. E. Palmer, proprietor of the Arrawana mills, at Saddle Hill, proposes to thoroughly equip his new mill at the foot of Centre street with new machinery for the manufacture of matting and hammocks. The new mill will be operated by electricity.

Evansville, Ind.,—The work of excavation will soon begin preparatory to the erection of the building for the local branch of the U. S. Baking Co., managed by S. S. Scanlin. The site is the quarter block of the northwest corner of second and Engle streets. The building will cost $50,008.

Elmhurst, Ill.—The grain cleaning warehouse of W. L. Luce was destroyed by fire. The building was 5 stories high, with engine house. Loss, $50,-000. The warehouse will be rebuilt.

Lancaster, Pa—The contract for building the large cigar factory, which Mr. S. R. Moss will have erected at the corner of Lemon and Prince streets, has been given to Burger & Bachman, the well-known contractors. The main factory will be 35x145 feet, and six stories high. Another building, 50 by 18 feet, will be erected beside it. When completed the factory will cost $40,000.

New York City.—H. Rabbe & Sons, owners and architects, of 474 West 14th street, will erect a five-story brick factory, 54 by 100, at Nos. 319, 321, and 323 West 64h street, to cost $30,000.

Holyoke, Mass.—Ex-Mayor Jame H. Manning, of Albany, N. Y., is interested in the erection of the proposed plant, with mills attached, at a cost of $50,000, which is to be completed by Nov. 1.

Wilmington, Del.—Contractors A. D. Reed & Bro. will erect a brick factory at 19th and Tatnall streets for Anson A. Maher. Mr. Maher proposes to equip the factory with machinery imported from Germany for the purpose of graining paperby improved process.

Hartford, Conn.—Chas. G. Perkins will build a brick factory, 137 by 42 feet, three stories high, with ell 92 by 35 feet, on the west side of Woodbine street. Hartford City Gas Light Co. will make repairs in boiler house, and put in new boiler at Nos. 6 to 22 Front street.

Brooklyn, N. Y.—Kirkman & Son will erect a new five-story factory building, 50 by 85 feet, Bridge street, northwest corner of Water street. Cost, $40,000.

Menominee, Mich.—A new steam laundry building will be erected by Frank Hone.

Galveston, Texas.—The Empire Mill Co. proposes to build a cotton oil mill and ginnery at or near Temple; principal office, Galveston. Rufus L. Heflin, Walter J. Betts, Lee F. Cowan. Capital stock, $100,000.

Niagara Falls, N. Y.—John Bogar, of New York, consulting engineer of the Cataract Construction Company & Niagara Falls Power Company, visited Kakabeka Falls, in Canada, for the purpose of looking for a site for the proposed large pulp and paper mill. It is proposed to build a $1,000,000 mill for the manufacture of paper for shipment to the English market. Among the gentlemen interested are E. V. Douglass, F. Douglass and J. F. Lewis, of Philadelphia; F. J. Vlerque, of Bangor, Me., and A. P. Bollen, and John Bogart of New York.

Passaic, N. J.—The contracts have been awarded for another big factory in the Dundee section of Passaic. One building will be of brick, 50 by 150 feet in area and four stories high, with a tower. Another building will be 50 by 90 feet, four stories high, and the engine and boiler house 44 by 68 feet, one story high. It is said these buildings will cost $75,000 and the machinery as much more. V. J. Hedden & Sons, of Newark, have the contract for putting up the buildings. They will be occupied by the firm of Prescott & Co., for the manufacture of enameline.

Chicago—Avenue D, South Chicago, L. Aaron & Co, 454 Pacific avenue, Chicago, and Pittsburg, Pa. Simpson, Robinson & Co., Room 415, Grand Pacific Hotel, Chicago, Architects, taking bids, cost $35,000, 60 by 130, five and one story high, common brick, stone, stone trimmings, architectural and galvanized iron work, gas fixtures, plumbing boilers, engines

Chicago, Ill.—L. S. & M. S. R. R. and 102nd street, L. Aaron & Co., 54-14 Pacific avenue, Chicago, and Pittsburg, Pa., owners, Simpson, Robinson & Co., Room 415, Grand Pacific Hotel, Architects, Chicago, mason work let, cost $40,000, 50 by 100, 60 feet high, brick, stone, stone trimimngs, gas fixtures, plumbing, engines, and machinery.

Columbus, O.—Sealed proposals will be received until Sept. 19 for furnishing and placing in position, connecting up complete and ready for use, the following boilers for the Ohio Hospital for Epileptics, namely: Two boilers in a single battery, but to operate separately, each having 180 h. p.; also one of the above boilers set complete, the other furnished at a later date when so directed by the Board of Trustees. Second, one boiler of from 250 to 275 h. p., set so as to unite with a similar one of same size at some later time. Boilers to be of horizontal type of water tube boiler, and to be in all respects in full conformity with plans and specifications on file in office. By direction of Board of Trustees. Yost & Packard, architects.

CHURCHES.

New York City.—The Grace Methodist Episcopal Church will erect a new one-story brick church on 104th street, 275 feet west Columbus avenue, to cost $67,000.

Philadelphia, Pa.—The West Park Presbyterian Church have accepted plans for their new building on the corner of 54th street and Lansdowne avenue. It will be built of Anondale stone, with Indiana limestone trimmings, and will have an octagonal stone tower over 100 feet high. The size of the building is to be 80 by 110 feet.

Plans prepared by Architect T. Frank Miller for a parish building for the Church of Good Shepherd, Cumberlandand Thompson streets, were approved. The building is to be two stories in height, 30 by 64 feet. The same architect has drawn plans for the new $25,000 building to be erected at Ft. Washington for the Reformed Church. This is to be one story high, and capable of seating 400 in the auditorium and 300 in Sunday-School.

Brooklyn, N. Y.—A permit has been asked for the erection of the Swedish Lutheran Church, on the southwest corner of Pacific street and 3rd avenue This church will be of brick with terra cotta trimmings, 71 by 100, and will cost $60,000. The St. Luke's Lutheran Church will erect a one-story and gallery brick church, 64 by 104 on Washington avenue, south side, 220 feet south of Willoughby avenue. To cost $36,000.

Chicago.—Commercial avenue and 88th street, South Chicago, Church of the Immaculate Conception of B. V. M. owners, Martin Carr, 620-134 Van Buren street, architect, taking bids, cost $160,000, one story high, brick, stone trimmings, steam heat, plumbing, tower of 160 feet. Seating capacity, 1260. It is probable that only the basement will be put in this year.

Baltimore, Md.—Plans for the erection of a new church in the rennaisance style by the congregation of St. Peter's Lutheran Church, have been completed. The building will be one-story, 42 by 95 feet. A three-story parsonage will be commenced with the church. The cost of the two buildings is estimated at $25,000. The contract for building Reid Memorial Church has been let to Geo. A. Blake for $25,000. It will be built on East Madison street, near Hartford avenue for the Hope Mission of the First Presbyterian Church.

Evanston, Ill.—Chas. T. Bartlett, of Evanston, has received the contract for building the new Presbyterian Church. The contract is for a building to cost about $45,000, not including seating, steam heating or the organ; the whole will cost $50,000.

First Presbyterian Society, owners, D. H. Burnham, 1140 Rookery, Chicago, architect, receiving plans for a new church, to cost $60,000, one-story, brick stone, pressed brick, stone trimmings, furniture, seating, carpets and drapery.

Buffalo, N. Y.—At a recent meeting of the trustees of the Central Park M. E. Church, it was decided to begin as soon as possible the construction of a new church edifice at the corner of Beard, Wesley and Morris avenues, Central Park. The structure will cost $12,000 to $15,000. Architects Metzer & Greenfield have nearly completed the plans.

Windsor, Vt.—Saxe & Son have just completed a set of plans for a Methodist Church at Windsor, to cost $10,000.

Pittsburg, Pa.—Plans are now in the hands of the architects for the erection of a new Bethany Lutheran church on the site of the present building on Highland avenue, East End. The building will be of Cleveland cut stone and will necessitate the removal of the parsonage. It will cost about $30,000. A new church will be erected by the St. Ambrose Church. First floor is to be used as as school room. To cost, $11.097. The church will be erected in the 11th ward, Has large avenue and is to be two stories high, of brick. Architect Chas. Heckel; contractor D. Heinrich.

Cambridgepot, Mass.—A permit was granted the Unon Methodist Church Society of Cambridge to erect a large brick and stone building on Main street known as the Cambridge Temple. Designed by Clarence H. Blackall and Newton of Boston.

Hazelwood, Pa.—The Hazelwood Presbyterian Church, Rev. W. W. Faris, pastor, has decided to build a new church edifice. It will be a brick structure, trimmed with stone, to cost about $18,000. A prominent architect has submitted plans.

Williamsbridge, N. Y.—The Methodist Church has commenced the erection of a new building to be built of Ohio sandstone. The contract was given to the Thompson-Decker Construction Co., of Cleveland, O. To be on White Plains avenue, at end of 4th street, to cost $35,000.

Newark, N. J.—Chas. A. Grifford, architect, has drawn plans for a new church to be erected at Madison, Clinton and Belmont avenues, three-story brick, for the Central Presbyterian church. Cost $20,000.

Detroit, Mich.—N. E. corner of Alexandria and Grand River avenues, United Presbyterian Society, owners, contract not let, brick, stone trimmings, undecided heat, electric work, slate roof, electric lighting, plumbing, church fixtures and furniture.

Columbia, Pa.—The proposed new church to be erected by the congregation of St. Peter's Catholic Church, will stand upon the vacant lot between the parochial residence and the convent. The new building will cost from $20,000 to $25,000. The work will be commenced in the spring of 1895.

Allegheny, Pa.—A permit was obtained for the new St. Ambrose Catholic Church, to be built at Haslage avenue. The building is to be 40 by 80 feet, and first floor will be used as a school room. To cost $11,097.

Yonkers, N. Y.—Yonkers is to have another new Catholic church, to be called Holy Trinity Catholic Church. It is to be situated at Walnut and Frankling avenues. It is to be for the Slavs of Yonkers, who number 4,000. The church is to cost $12,000.

Hammondsport, N. Y.—The vestry of St. James church, at said place, have decided to build a new church of stone at a cost of not more than $10,000. Reported burned Aug. 6.

Schenectady, N. Y.—The Emanuel Baptist Church congregation, Nott Terrace, have purchased the Hannigan property, one door south of the church, for $40,000. It is their intention next spring to erect a handsome edifice upon the site.

Red Oak, Iowa.—The Presbyterian Church will improve their building by additional seating and hot air furnace. Isaac Sanburn, Jr., clerk of the building committee.

Georgetown, Ky.—R. H. Hunt, Keystone Building, Chattanooga, Tenn., has the contract for the erection of the $25,000 church for the Christian Society. The plans were prepared by the contractor.

TRADE NOTES.

The Modern Heating Co., of St. Louis, of which John J. Collins, formerly of Cahill, Collins & Co., is president, report the sale of Ideal boilers to the following parties in St. Louis: Mr. A. Manwald, Mr. J. H. Morning, Mr. C. H. Bogel, Mr. J. E. Brady, Mr. W. Kennedy, and Hon. Norman J. Colean.

The Baker & Smith Co. have recently placed three of the Ideal hot water heaters, through their Louisville branch, in the residences of R. H. Otter, John Otter and Henry Wolff, of that city; and through their Chicago house, one of the largest size ideal boilers in the residence of C. V. Drew, of Chicago.

The L. H. Prentice Co., recently secured contracts for hot water heating in the residences of Mrs. M. E. Bundy, South Evanston; Mr. W. B. Judson, editor Northwestern Lumberman, on Michigan avenue; Henry Dibble and J. J. Mitchell, of Chicago. The Ideal hot water heaters are to be used in all these contracts.

The Deane Steam Pump Co., of Holyoke, Mass., with New York office on Cortlandt street, report lots of new work, their water pump department being especially busy. The Fidelity Casualty Company, of New York, who insure and inspect a majority of the elevators in the city, have selected the Deane compound elevator pumps for their new building, corner of Church and Cedar streets.

An Item is making the rounds of the daily press to the effect that a new system of ventilation has appeared which should prove serviceable in hospitals, conservatories and public buildings where the temperature has to be kept within certain limits. The apparatus consists of an electro-magnet, placed in circuit with a battery, and a revolving drum, and its operation is dependent on the electric control of one or more air valves by means of a thermostat or thermometer adjustable to certain predetermined degrees of heat or cold. It can be adapted to any existing air shafts or any form of ventilator, and it can also be applied to the working of ventilating fans for starting or stopping at certain temperatures. Supposing that it is desired to keep a room between 65 and 75 degrees F. The apparatus is adjusted to these two points on the thermometer or thermostat, and as the temperature rises to 75 degrees contact is made, the drum turns a quarter of a revoluiton, opens a ventilator and cools the room. The circuit is then broken. When the temperature falls to 65 degrees contact is again made, and the drum rotates and closes the ventilator. The action is reacted every time either limit is reached. The apparatus can be so nicely regulated as to work with a variation of 2 degrees of temperature, and it requires very little current—considerably less than that required to ring an ordinary electric bell."

The Central Supply Association, composed of jobbers and manufacturers of plumbers', gas and steam fitters' supplies, effected a permanent organization in Chicago, September 4. The object of the association is for the purpose of promoting more intimate social relations and correcting many evils that from time to time arise in the trade. The formation of local associations n the different cities throughout the territory was decided upon, and the following members were appointed to organize them: Chicago and Denver, John F. Wolff; Indianapolis and Louisville, Theodore Ahrens, Jr.; Detroit, John Walker; Minneapolis and St. Paul, John Sullwald; Kansas City, Mr. Young; St. Louis, W. Whittaker; Cincinnati, Geo. B. Hawley; Cleveland and Toledo, Ed. H. Foster; Pittsburg, O. F. Felix; Milwaukee, Alfred Fowle, Jr.; Omaha, Wm. M. Webster; Buffalo, Syracuse and Mansfield, John S. Palmer

By vote of the convention the following gentlemen were requested to prepare papers to be read at the next meeting to be held in Cleveland on the second Tuesday in December: John Walker, of Detroit, on Boxing and Cartage; Geo. T. McIntosh, of Cleveland, on Traveling Men; Theo. Ahrens, Jr., of Louisville, on Cash Discounts and Freight Allowances; George Dewing, of Cleveland, on Net Prices. Most of the leading jobbers became members and it would seem that a most beneficial organization had been formed. The officers of the new association are as follows: President, John F. Wolff, of the L. Wolff Manufacturing Company, Chicago; First Vice-President, John Walker, of JamesWalker & Son, Detroit; SecondVice-President, Theo. Ahrens, Jr., of the Ahrens & O. H. Manufacturing Company, Louisville, Ky.; Treasurer, O. F. Felix, of the Pittsbury Supply Company, Pittsburg, Pa.; Secretary, W. M. Webster, of Smith & Webster, Chicago.

The secretary of the American Society of Heating and Ventilating Engineers, can be addressed at Room 145-146, World Building, New York.

A. Mugford, the engraver, of Hartford, Conn., is still turning out fine work, and we beg to thank him for the beautiful half tones with proofs of which he has favored us.

The Thos. Jacobs Co., of Chicago, recently placed Ideal hot water heaters in the residences of H. R. Wilson, Grand Boulevard; Oscar Foreman, Michigan avenue, and N. A. Williams, on West Monroe street.

The many friends of Mr. Albert A. Cary, of the Abendroth and Root Manufacturing Co., New York city, will be sorry to learn that he has been seriously ill for the past few weeks with appendicitis, and was recently obliged to undergo an operation. He is at present doing nicely and expects to be out in a few days.

The Penn Engineering Co., of Philadelphia, Pa., send us circulars of the Ball joint pipe hanger with which they claim pipe can be hung closer to the ceiling than with any other. It is uniform in all its parts, and when pipe is hung makes a neat appearance. The joint being a ball and socket, the hanger will swing in any direction in which the pipe expands. With the use of this hanger the pipe, after being hung, can be raised or lowered without taking the hanger apart..

McGinnis, Smith & Co. Pittsburg, Pa., report that they have placed contracts recently for the Ideal hot water heating apparatus, as follows: For Thos. Mellon, Nagley avenue; Hancock Public School, Webster avenue; Daniel J. Cullian, Main street; Wm. Johnson, Winebiddle avenue; M. & M. Insuranec Company; A. K. Stevenson, Forbes street. In Sharpsburg they have placed a hot water heating apparatus in the house of Hugh Kennedy. In Macdonald, Pa., in the residence of S. H. Cook and W. B. Morehead, and in all of these residences, requiring ten boilers, they have used the new Ideal hot water heaters, manufactured by the Ideal Boiler Co., of Chicago.

Rives and Co., a highly reputable firm of Rochester, N. Y., are manufacturers of hot air registers, ventilators and border frames, either in black or white japan, nickel, copper or brass plated, also in gold, silver and copper bronze. Their goods are all of standard size with those of other leading manufacturers. A prominent feature of their goods is their designs, which are of a very artistic and high order. They have also made a great study of the two important essentials in the face plates, strength and open area, points which furnace men will not fail to appreciate, the merit of their respective furnaces depending greatly upon the latter. Their prices are low for the best goods, and the furnace trade will find this house one whose dealings are in every way reliable.

The following letter to J. Leland Wells, chairman of the executive committee of the Master Steam and Hot Water Fitters' Association of the United States, from Mr. D. M. Nesbit, of Ashwell & Nesbit, warming, ventilating and hydraulic engineers, London, W. C., is self explanatory:

"It gives me great pleasure to acknowledge your letter of July 20, which conveys to me the news that the Master Steam and Hot Water Fitters Association of the United States have thought it fit to elect me an honorary member (the first honorary member, I believe,) of your association.

"Words fail to express in adequate terms my appreciation of the great honors your body has conferred on me.

"My visit to the States this summer, the making of so many dear and kind friends on the other side of the Atlantic, coupled with the distinction I have alluded to, will be ever fresh in my memory, and as I stated at the convention, a 'Red-letter day in my career as a heating and ventilating engineer.

"Please convey to the association my best thanks for the distinction conferred upon me, and I shall always be glad to render what service I can to your association.

"Again thanking your body collectively for the great kindness and courtesies extended to me during my visit to the States."

The Onderdonk Heating and Ventilating Co., of 520 Commerce street, Philadelphia, are introducing to the trade the Onderdonk Combination Steam Trap. Steam fitters and all users of steam traps are well aware that when steam is turned on radiation while cold, a large amount of condensation is created, which, in rushing through the returns pipes, always floods the trap until the surface has become hot. The ordinary float traps are provided with so small an outlet that it is impossible for this great rush of water to be discharged without flooding. Appreciating this difficulty this company have put upon the market this combination float and expansion trap, which may be described as follows: There is provided in the bottom an outlet of the same size as inlet. This outlet is controlled by a valve, which is connected to a lever arm and an expansion spring. When only water is returned to the trap this outlet remains wide open and allows the water to discharge from the trap as fast as it enters. As soon as steam enters the trap the springs are expanded and this outlet is closed. The condensation is then controlled by a float and is discharged through a much smaller aperture. By the use of this trap flooding of steam or return mains is impossible and no steam whatever can waste, as the large port is immediately closed as soon as steam enters the trap. All danger of freezing is avoided, as all the water in the trap is discharged as soon as it becomes cold. In high pressure mains of great length, where it is necessary to bleed at intervals of 100 feet or so, the trap will be of very great advantage, as it is not necessay to provide any by-pass around it the expansion part serving this purpose. It is claimed that this trap will take care of a much larger amount of condensation than any other on the market, and it will also serve as an absolute air vent for any heating system, relieving it of air through the outlet of the trap. Please mention H. & V. in sending for free circulars.

The fact that the sale of Eureka air valves for August this year was over five times as large as for the same month last year speaks well for the valves. Hodge Bros. have some good orders booked for Europe through their Denmark agent, and they anticipate a good season both on valves and dampers.

J. J. Wilson, heating engineer, Fuller & Warren Co., has just closed the contract for heating St. John's Catholic Church Frederick, Maryland. Two No. 350 cast combination heaters will be used. The church contains 284,000 cubic feet of space. The work will be installed by H. J. Nelson & Son, Frederick, Md.

The calendar which M. Mahony, of Troy, is sending to his friends for the month of September has as a frontispiece a charming hunting scene, which immediately carries one's thoughts to the many good times he has had in the woods, and adds a bright spot to the worry and cares of business, when glanced at.

Are you tired of seeing ceiling plates slip down the pipe? asks J. W. Chamberlain & Co., of Bangor, Me. Then they go on and enumerate the advantages of the Columbia, which is becoming very popular among steam fitters. If you haven't seen the Columbia, why don't you send for a circular or sample of it? Mention HEATING AND VENTILATION.

It is claimed by the manufacturers of the Locke damper regulator, which is described in this issue on another page, that the home made damper regulator illustrated and described on page 16 of our August issue, is a direct infringement of the Locke patent. Suit was recently brought against the Third Avenue Cable Road, of New York for using the Spencer regulator, which employs the patented features which distinguish the Locke regulator. Ninety-four of the Locke regulators are in use in the city of Fall River, Mass., alone, these regulators replacing some of nearly every other make.

Mr. Walter P. Warren, president of the Fuller & Warner Co., of Troy, N. Y., says: "The past six months has been an unusually busy time for us in our pattern department, and we have placed upon the market for sale this year many new goods, the most prominent of which are several new ranges, a first-class parlor stove, and a full line of furnaces of great heating capacity, with fire pots ranging from 18 to 35 inches in diameter. All these new goods can be sold at moderate prices to suit the times, and we unhesitatingly announce that we are better prepared than ever to furnish our customers with stoves, ranges, furnaces, and hot water heaters, all manufactured in our works and under our personal supervision, and guaranteed to give perfect satisfaction."

The Joseph Dixon Crucible Co. Jersey City, N. J., manufacturers of lead pencils, crucibles, stove polish and other graphite products, have felt the necessity of stiffening the backbones of their salesmen who have complained of competitors' cut prices, and do it after the following fashion. In times like these, when work is none too plenty, and the manufacturer is anxious for orders and the salesman likewise, there is great temptation to cut prices for the sake of getting a quantity of business and thereby deluding ourselves into the idea that we are prosperous because we are busy, forgetful of the fact that the more busines one does at a loss the slimmer will be the bank account at the end of the year. Prices once broken down are hard to re-establish, and it is even doubtful if they can be re-established. Furthermore, a manufacturer who once gets the reputation of making cheap goods will find it difficult to obtain good prices even for his best goods, and fine products at good prices are always in fair demand at all times. There is neither money nor reputation to be gained in doing work for less than a fair price, and the very men who profit by beating the salesman down and by inducing him to enter their order at cut throat competition prices, respect him less, and respect his house less, than if he had stuck manfully to the principle that first-class goods demand a fair price.

The leading ventilating engineers and architects are of pretty near a unanimous opinion that mechanical ventilation is undoubtedly the future means of ventilating our large public buildings, halls of audience, schools, theatres, factories, mills and the like. Nothing is more indicative of this than that during the present times one of the well-known manufacturers of apparatus for this purpose (Buffalo Forge Co., Buffalo, N. Y.), have been running their works full time in order to keep pace with orders. School boards and building committees are fast coming to realize the importance of positive ventilaiton, and as there has been comparatively little building going on among manufacturers, this fact is unmistakably substantiated by the orders now being executed by the above house, which are largely from this source. The following are a few recent orders from the pages of the Buffalo Forge Co.'s order books: Ashland avenue high school, Denver, requiring two fans 130 and 100 inches, respectively, with heaters containing nearly 30,000 feet of 1-inch pipe; Dartmouth street school, Worcester, Mass.; grammar schools Nos. 5, 9 and 79, Newport City, 130 and 140-inch fans, respectively; Oregon State Agricultural College; Pennsylavnia State College, Eldora high school, Eldora, Ia; Kirwkood Hall, Bloomington, Ind.; Mason City high school, Mason City, Ia.; George W. Chlid's Ninth Ward school, Philadelphia; Erie County Penitentiary, Buffalo, N. Y.; Gallopolis Epileptic Asylum, Gallopolis, O. (nine buildings); Baltimore music hall, Baltimore, Md.; Denver state capitol, Denver, Col.; National Union building, Toledo, O.; Brooklyn high school, Brooklyn, N. Y.; Erskine church, Montreal, Que.; State University, Minneapolis, Minn.; and Union Depot, St. Louis, Mo. Besides these the company send us a further long list, but we haven't space to mention them. We think the foregoing will show that their apparatus is very popular.

Edward E. Parker, of Woburn, Mass., has been awarded the contract for the heating and ventilation of the new Stoneham armory.

Mr. Joseph Campbell, of Middletown, Pa., has transferred his interest in the Susquehanna Iron Works (Raymond & Campbell) to the Raymond Bros., he retiring from business after a long and successful business life.

Plans are out for an addition to the Rumford school-house, Woburn, and a steam heating and ventilating plant for the whole building. Wales & Hoyt, of Boston, the architects, estimate the probable cost of the heating apparatus at $2,500. A new two-room school-house is also to be erected on Cambridge street, Woburn, to cost $4,000. Furnace heat.

The Powers Regulator Co., of 36 Dearborn street, Chicago, are out with a circular saying that they will defend all suits brought against their apparatus. This circular was called forth by the buying up of an old patent, which it is claimed by a rival concern which has evidently felt the competition that the Powers Company have given them, that the Powers Company infringed. In the meantime, the Powers people go right on securing new school work and are evidently becoming very popular in this field.

T. C. Joy & Co., of Titusville, Pa., New York office 48 Centre street, announce that they are now prepared to furnish the Orient in the following heights: 45, 39, 31 and 24 inches. The 45-inch contains six feet, the 39-inch 5 feet, the 31-inch 4 feet, and the 24-inch 3 feet of surface per section. For hot water add ½ inch for each bushing. The distance from floor to center of opening for one pipe, or return end of two pipe work, is 4 inches for steam and 4½ inches for water. Radiators can be furnished with feet 2 inches higher than the above, but are not kept in stock.

We are pleased to note that the Roe-Stephens Manufacturing Co. of Detroit, Mich., did a larger business in July than during the same month in 1892, when business was rushing all around. Their August business, while not computed at the time this was written, promised a considerable increase. The base ball nine, composed of employes of this shop, have also been victorious over all the other nines, and it would seem that Mr. Stephens has the happy faulty of calling around him the most intelligent men in all departments, thereby securing success.

Hayes & Falls, of Rochester, N. Y., are doing the heating of public school No. 17, that city, which has sixteen rooms. The heating is indirect radiation, steam being supplied by a pair of 25 horse-power tubular boilers. Other work they are doing is the high school, Watertown, N. Y., which is heated by three No. 10 "Torrent indirect; the Delinger House, Redwood, N. Y., also by Torrent boilers, direct; the new building of Black & Myers, clothiers, Rochester, N. Y., 35 horse-power tubular boilers, direct; Goldwater Bros.' new building, Rochester, N. Y., and several others.

The Heating, Ventilating and Sanitary Work for the proposed new schools at Syracuse, N. Y., has been decided by the mayor and board of aldermen approving the action of the board of education in awarding the contract for five new schools to the Peck-Williamson Co. of Cincinnati, at their bid of $9,950. Many eastern as well as local concerns fought over every inch of the ground. The press has printed column after column of the controversy, so that in northern New York the name of Bennett & Peck, the former name of the company, must be as well known as that of either the President or Senator Hill.

The Ranton Boiler Co. of Syracuse, N. Y., is out with their new catalogue of boilers, stand pipes, smoke stacks, tanks, and all kinds of steel plate and sheet iron work. A full description of the boilers, list of fixtures, measurements for setting stationary boilers, etc., are given. Special attention is called to the new economizer boiler, also to the Ranton patent upright boiler for steam or hot water heating, or for power purposes. These boilers have all been fully tested, and the line is very complete. The company also manufacture all kinds of marine boilers from specifications furnished them, or will bid from their own plans and specifications. In these boilers the best marine steel is used. Mr. W. J. Ranton, president of the company, has been identified with the manufacture of boilers all his life, and has been very successful. This assures the buyers that the goods manufactured by the company are up to the standard in every way.

The Triumph Warm Air Furnace is the title a new catalogue sent us by the Craig Reynolds Foundry Co. of Dayton, O., who manufacture warm air furnaces and combination heaters. The catalogue has a treatise on the principles of heating and devotes special attention to the necessities of ventilation, which HEATING AND VENTILATION *alone* is urging at a large expense. The Triumph furnaces are known as the Triumph Special, with steel radiator, five sizes; the Triumph, five sizes, all cast; the Triumph King, four sizes, all cast; the Triumph Steel, five sizes, and the Triumph Air Blast, five sizes, low down pattern. The first named is for hard coal, the second for hard or soft coal, the air blast for soft coal. The Triumph Combination heater is portable or brick set and is designed for hard or soft coal and made for air and water or air and steam. Full description is given. A special feature is the triangular revolving duplex grate, and the Triumph air blast attachment, used in connection with the Triumph all cast, and Triumph King. Useful tables and hints, among which "A good chimney flue is especially considered as absolutely necessary," follow. We heartily endorse this last. The Triumph furnaces are built with especial reference to low cellars. This very excellent catalogue will be sent by mentioning HEATING AND VENTILATION.

The Exhibit of Thomas Wethered's Sons, consisting of models, was highly commended for their improvements and ease of operation at the convention of florists held at Atlantic City, N. J.

Rives & Co., of Rochester, N. Y., have been very successful in introducing their new "Superb" hot air register, which they haver offered to the trade for the first time this year.

The following clipping from a Utica daily paper is self explanatory: The Carton Furnace Company of this city has been awarded the contract for the heating of the Butterfield house. This is not only a large contract, but it will be a very elaborate job, and will be heated on the most approved plan. Two steam boilers are to be used, and will be set in "battery." There will be 149 radiators used; every room, also the stores on Genesee and Devereux streets will be heated. There will be about 7,000 square feet of radiation used. The kitchen will be equipped for steam cooking utensils on the latest approved pattern, and the laundry and dry rooms will also be fitted up with the latest steam appliances. Such contracts as this have in the past been let to out of town heating concerns competent to figure on such work, but in the future this successful company will be in a position to keep such work in Utica, and this branch of their business will materially increase the number of the employees. This business was established by the late John Carton in 1847, and since that time has grown, in volume and reputation, until to-day it is one of the leading heating concerns in the United States. This company also has the contract for heating the new residence of John Bryan, on Lansing street, with one of their hot water boilers.

The Positive Radiator Co., of Twenty-first street and A. V. R. R., Pittsburg, have for several months been making many improvements in their new radiators, and are now out with their new circulars. They say "we have greatly improved the Positive for 1894 by increasing the size of the air ducts, by making all metalic joints, no rubber or other packing to rot out and cause leaks, no extended surfaces; every inch is prime surface in the "Positive." The steam is carried up the first or feed end section and equally distributed across the top of the radiator, thus putting it at once above the water of condensation, and as a result, no water can accumulate in the radiator, the ascending steam does not pass through the descending condensation, and consequently they are using dry steam. The baffle in the first or feed end section has an opening below the water line to allow the water of condensation to escape, thus forming an individual seal in each radiator. The steam cannot blow back against the feed, but is all condensed in the radiator. In hot water heating the water is also carried up the first section and equally distributed across the top and then descends as it cools; hence there is no friction between ascending and descending bodies in the same section, as the current is up the first section and down in all the others. By this positive circulation the makers claim that air valves are unnecessary.

The Taylor Burner Co. limited, of 240 Market street, Pittsburg, Pa., send us their latest catalogue of ornamental gas fires, furnace and range burners, Taylor gas and air mixers, and the Talyor open grate gas burners. The "Myrtle" Talyor gas heating stove is most handsome in design and is said to be very effective in heating, the heat radiating surface being 189 square inches, and very economical in consumption of either natural or artificial gas. The Myrtle produces a most healthful heat, a subject that has been given but little thought or study in the construction of gas saving devices. That this is true has been fully demonstrated by the too many flueless stoves that are in the market which have produced untold destruction of health by distributing throughout the rooms and halls the product of every gas fire—carbon dioxide. This gas cannot be seen, smelled or tasted, but its effects are sadly felt, as it undermines the health of those living where it is present. This will be so as long as gas fires are permitted to burn in halls and rooms without a flue connection, as it is impossible to produce perfect combustion without, at the same time, producing carbon dioxide. The merits of other devices shown by the company in this catalogue are very highly testified to by prominent users, and every dealer who wishes to handle the best of gas appliances will do well to have this catalogue in hand. It is sent free by mentioning HEATING AND VENTILATION.

George M. Rossman, of Keene, N. H., is installing the steam heating apparatus in the Lane block and Keene National Bank, Keene, N. H., using Exeter ornamental radiators.

The Powers Regulator Co. is the new name of the company, formerly known as the Powers Duplex Regulator Co., who have been so successful in introducing their apparatus for temperature regulation. Office, 36 Dearborn street, Chicago, Ill.

Hussey, McCann & Co. of 15 Cortlandt street, New York, have been very successful in introducing their "Peerless" grease extractor for removing oil and other impurities from exhaust steam. Its use effects an important saving in fuel and in cost of boiler repairs, and every engineer should send for free copy of their new pamphlet.

Taylor Bros. of Rochester, N. Y., send us part 7 of their catalogue of thermometers and thermometric steam gauges for steam and hot water heating. The catalogue contains as a preface a treatise on the value of a thermometer in hot water heating systems. A cut of their testing apparatus is shown, also illustrations of the different styles of goods, of thermometers and altitude gauges made by them. An interesting part of the pamphlet are pages 10 and 11, which give variations in the comparative reading of temperature and pressure scales in thermometric steam gauges at different altitudes, and table of corrections for altitudes to be applied to the thermometric steam gauges graduated with zero of pressure at 212 degrees. This pamphlet is sent free upon application.

Messrs. Babbitt & Wood, of New Bedford, have the contract for heating a residence in North Easton, Mass., besides some steam heating contracts in New Bedford. The Furman boilers are used in all of their late work.

The J. F. Pease Furnace Co., of Syracuse, N. Y., have secured the services of S. E. Slater, formerly of Ohio, to act for them in Chicago and adjacent territory. He will have charge of the installation of their apparatus, and incidentally boom its merits.

Geo. A. Sanders, of Laconia, N. H., is just finishing up three nice heating contracts at Meridith, N. H., where he has set one Furman boiler for the public school, one for Judge Rollins and one for Miss Ladd. Mr. Sanders has also some good plumbing contracts in for the finest residences along the lake.

The Carton Furnace Co., of Utica, N. Y., send us five new circulars, which they have just issued for handy reference to the apparatus they manufacture. Each one has a unique picture of a "Brownie," with a fan, looking as though it was hot, inside of the big C of the company's name. Points of excellence, both of their furnaces and combinations, followed by a list of sizes, are given, and special attention is called to their soft coal hot blast smoke consumer, which, with the exception of its special adaptation to burning soft coal, is made up on the same principles as are embodied in the Carton gas tight furnace that has stood the test for nearly half a century.

(*Continued on page 26.*)

THE CELEBRATED SANITAS TRAPS

ENDORSED BY SANITARY EXPERTS AND LEADING PLUMBERS.

SANITAS Traps are used unvented in many of the principal cities of the United States, making a great saving to the Plumber and to the user. The Sanitas is the only Trap that will stand both syphonage and evaporation and hold its seal under the most adverse circumstances. Plumbers interested in giving their patrons the best will invariably give preference to the Sanitas Traps Made in Lead, White Metal or Iron. Send for Special Circulars

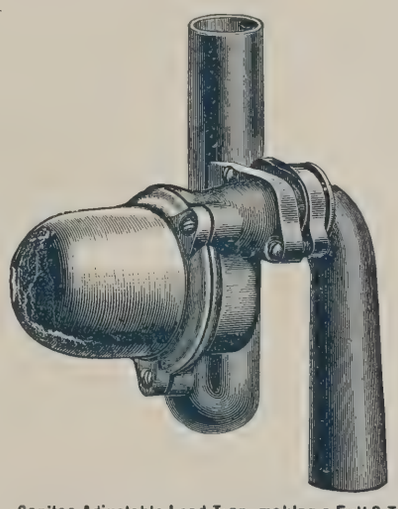


Fig 9. Sanitas Adjustable Lead Trap, making a Full S-Trap.



Fig. 11a. Sanitas Brass Trap.

Smith & Anthony Co., MAKERS Sanitas Plumbing Appliances.

48 to 54 UNION STREET, BOSTON.

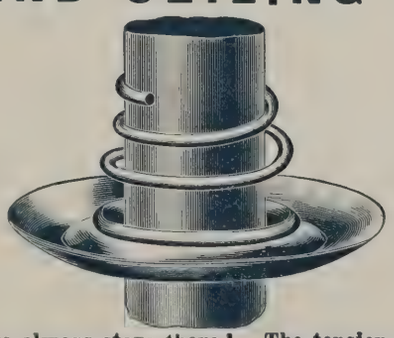
56 BEEKMAN ST., NEW YORK. CHICAGO AGENCY, 217 LAKE ST.

"COLUMBIA"

WALL AND CEILING PLATE.

SEE

Those smaller spirals at the top?
They grip the pipe!
See those larger ones below?
They hold the plate and allow for expansion and contraction of the pipe!



Easily adjusted and inexpensive!
Made in all sizes.
Send for circular and prices.
Sample on application.
Ask your dealer for them or send to the manufacturers.

Once in place this plate always stays there! The tension of the spring keeps it!

The J. W. Chamberlain Co., Bangor, Me.

The Van Auken Steam Specialty Co., of Chicago, have just issued a neat little circular, the first page of which shows a crowd of people anxious to look through the latest make of telescope at a supposed new star in the heavens, which, upon examination, proves to be the perfected duplex air valve. The circular also refers to many well known architects who are specifying the valves.

At the National Florist's Convention, lately held at Atlantic City, N. J., the Herendeen Manufacturing Co. were awarded the certificate of merit for their display of Furman boilers. The committee say, further: "Noting their admirable construction, and their adaptability for the consumption of the smaller sizes of coal, they being cheaper, and also their adaptabiltyfor either water or steam."

The School Board of the Second ward, Allegheny, claim to be about to erect the first high school building in the State of Pennsylvania. They have contracted with the Peck-Williamson Heating & Ventilating Co. of Cincinnati, for heating, ventilating and sanitary work for the sum of $4,925 Mr. Williams, manager of the Pittsburg branch of this company, told the board that this was his first contract for the company since the old name of Bennett & Peck was dropped.

The Bellevue, Ohio, News, under date of August 10, says that the local board of education has arranged with the Short-Conrad Company, of Cleveland, O., for an installation of telethermometers in the Central school building, that town, and that Mr. Short has given the same his personal supervision. Each room has an indicator which is connected by tubes with the one in the basement. With this device the temperature of all rooms in the building is very easily ascertained and perfectly regulated by the janitor from the basement without annoyance or inconvenience to anyone. Telethermometers of the Short-Conrad Company have received the approval of several manufacturing companies upon whose apparatus it has been placed.

Burbank, Studd & Metze, 51-53 Main street, Berlin, N. H., write us, under date of August 14: "We find business good. We have recently closed contracts for four hot water jobs and two steam jobs, using Hart & Crouse "Royal" heaters. We have the new Catholic church and residence, B. L. Pik's residence, E. C. Nile's residence, and a combination job in Dr. J. D. Holt's residence. We have the plumbing in the high school, and have all the work we can do now for some time, and at fair prices. We are using the H. B. Smith Company's radiators on our hot water jobs. We have put up a large number of Prince Royal furnaces here and not one complaint has reached us as yet, and some have been in three winters, and we shall put in a number this season. Mr. H. J. Whitcomb has been here several days in the interest of the Royal heaters. He is a hustler, and did not go away without some orders. We find much information in your paper."

Honorable Mention to Hitchings & Co., of New York, for their exhibit of boilers, noting simplicity of construction and ease of operation, says the committee on awards at the National Florists' Convention, lately held at Atlantic City, N. J.

WANTED.

Announcements in this department will be inserted at the uniform rate of twenty-five cents per line. For five or more insertions of the same advertisement we make a discount of 10 per cent. Calculate on nine words to a line.

WANTED.—An experienced radiator salesman; must be well recommended. Address The United States Radiator Co., Dunkirk, N. Y. State with whom last employed.

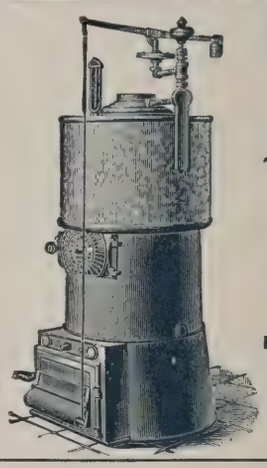
WANTED.—A competent Heating and Ventilating Engineer. Address, stating experience, locality of former service, references and other information with a view to permanent engagement, P. O. Box 284, Worcester, Mass.

Characteristics of a Popular Railroad.

Travelers find unexcelled accommodations and supreme comfort on the cars of the New York Central Railroad. American railways are noted for the advantages which they afford the traveling public, and there are none that surpass this splendidly equipped road.

The Holland Radiator and Manufacturing Co., of 69 Centre street, New York, have just issued a circular announcement of the opening of their New York office and warehouse, saying: "A complete stock in standard sizes is now carried in New York city, insuring prompt shipments." The circular also gives the "connections." "appearance," and "efficiency" of the radiators, followed by a list of sizes, etc.

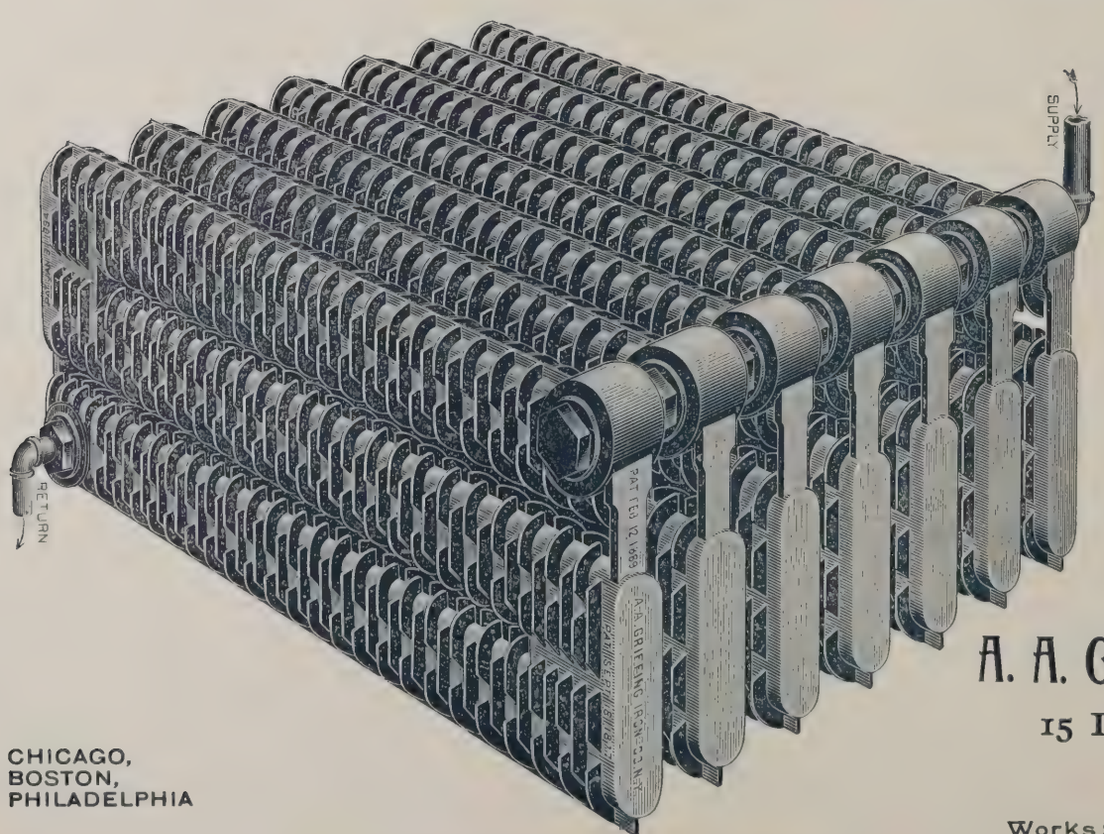
(*Continued on page xv.*)



VOLUNTEER
AND
ALL RIGHT.
The Best and
ONLY
Self-regulating
Hot Water Heaters
on the market
FOR STEAM HEATING.
Manufactured by
The Wm. H. Page
Boiler Co.,
Norwich, Conn

THE NATIONAL * *
TEMPERATURE REGULATOR
Will automatically keep the temperature of your residence
"JUST WHERE YOU WANT IT."
NO ELECTRICITY, NO UNCERTAINTY, but just plain WATER, which costs nothing, requires no attention, is ever ready and never failing.
A PRACTICAL DEVICE AT A MODERATE PRICE.
CORRESPONDENCE SOLICITED.
THE SHORT-CONRAD CO.,
Manufacturers of THE TELETHERMOMETER, for indicating and regulating the temperature of School Buildings.
Cor. Erie and Bolivar Streets, CLEVELAND, OHIO.

THE BUNDY
Newport Indirect Radiator ...



HAS a depth of 16 inches, large openings, all screw thread connections, no diaphragms to impede circulation, a gradual slant from feed to return, no air or water pocket, and is specially well adapted for hot water heating : : :

A. A. Griffing Iron Co.,
15 DEY STREET.
NEW YORK.
Works: Jersey City, N. J.

CHICAGO,
BOSTON,
PHILADELPHIA

BUNDY NEWPORT INDIRECT RADIATOR.

The New York office of the Magee Furnace Co. report a good business in furnace and combination work.

The J. L. Mott Iron Works, of New York, Boston and Chicago, are sending out a list of sizes of the Ornate radiator, for which they are sole agents. (Free on application).

When folks are at home is a neat little four-page circular with covers, just out, by the United States Heater Company, and which contains much valuable matter and is well and happily gotten up.

We are favored by Hohmann and Maurer, of Brooklyn, N. Y., with their latest circulars on thermometers, which are neatly printed in blue-black, the same color as this paper, and are illustrated in a neat and catchy manner.

C. H. Fischer, of 1334 Park street, Alameda, Cal., has secured the contract for heating the residences of William Rigby and Charles E. Naylor by hot water. Humber heaters and Holland radiators will be used. Mr. Fischer is one of the progressive men on the coast, in both steam, hot water and hot air heating, his specialty being old plant refitting. He says, "If they do not work take them to Fischer."

The A. A. Griffing Iron Co. of Jersey City, N. J., calls attention to the fact that the size of pipe used for lengthening out the lag screw of the various sizes of pipe hanger, printed in their descriptive circular of the Bundy Giant pipe hanger, was wrong. The sizes should be as follows: For ¾-inch and 1-inch hangers 1-8 inch pipe; for 1¼-inch to 3-inch hangers, ¼-inch pipe; for 3½ to 4-inch hangers, 3-8-inch pipe; for 5-inch hanger and larger, ½-inch pipe.

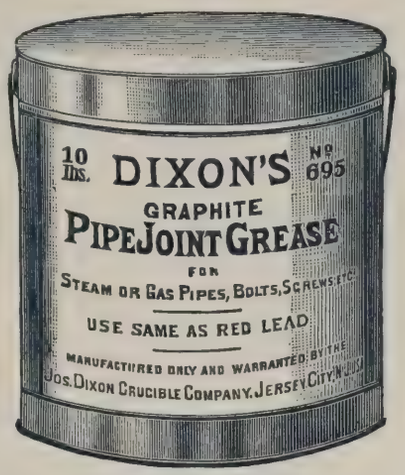
The Huyett & Smith Manufacturing Co. of Detroit, have recently secured the contract for furnishing the heating and ventilating plant for school building No. 19, Scranton, Pa., through their agents, Hunt & Connell Co, of that city. The Huyett & Smith Manufacturing Co. have also just completed the installation of heating and ventilating plants in the Motley school, Chicago.; Farrand school, Detroit, Mich., and in a school building at Port Huron, Mich.

The New Catalogue of "Sunray" steam and hot water heaters, is out. It is published by J. L. Mott & Co., the manufacturers of this apparatus, and has a preface on fuel, by J. J. Blackmore, heating engineer, after which a description of the boilers follows. We congratulate the Mott Company on the print of this catalogue, which is bold and plain, so that "he who runs may read." The cuts are also excellently arranged, and every fitter should add this to his reference books. Sent free by mentioning HEATING AND VENTILATION.

The St. Louis Radiator and Manufacturing Co., of St. Louis, Mo., under the efficient management of the "Garrisons," is booming forward with rapid strides. They tell us that within a few weeks they have sold to Stevens College, Columbia, Mo., 4,000 feet; Rose dispensary, Terre Haute, Ind., 6,000 feet; St. Louis public schools (to be heated by steam this winter), seven in all, 30,000 feet; Hudson Building, St. Louis, 4,000 feet; Blossom Building, St. Louis, 4,000 feet; the O'Neil Hotel and Forest Park cottage, 4,500 feet. They have also made recent shipments to Georgia and Tennessee, and negotiations for shipments abroad. The excellence of their work brings inquiries from the Atlantic to the Pacific, and from Germany and other European points. In view of the present state of the order book of the company the standard of excellence which they set out to mantain which should be above criticism, both for design and finish, commanding the highest market price, has proved the wisdom of their course, and the company propose to adhere to this high standard in all future production by them.

The New Illustrated Work on Newark, N. J., has this to say about the Thatcher Furnace Company: "This company was founded in 1850 by J. M. Thatcher, the inventor of the celebrated Thatcher furnace, and was incorporated in 1889, at which time the company moved their works to Newark, N. J. They manufacture the celebrated Thatcher tubular furnace for heating residences, schoolhouses, churches, etc., and the well-known Thatcher ranges, with single and double ovens. They also manufacture the Champion steam and hot water heaters. The Thatcher tubular furnace is sold extensively throughout the country, and has a very high reputation. Its popularity is fast increasing. Owing to its very large heating surface, it is not only powerful, but economical in the use of fuel. It is absolutely gas-light and very durable. The Champion steam and hot water heaters are more recent productions; but they have already gained a very strong position, and are now among the leading heaters on the market. The Thatcher ranges have a wide reputation for not only being beautiful in design, but for heavy castings and for excellence in cooking and baking. In fact the Thatcher Furnace Company have the reputation of making the very highest grade of goods in their line, so that each production that goes out is sure to recommend itself and lead to further sales. This, with the fact that their prices are no higher than inferior goods of the same line, accounts to a great extent for their success. Their rapidly increasing business has necessitated the removal of their office and sale room to the large five-story building, No. 240 Water street, New York, and has also obliged them to greatly increase their manufacturing facilities in this city. The works now cover the greater part of the block bounded by St. Francis, George and St. Charles streets. The officers of the company are Charles O. Lyon, president; Edward Benedict, treasurer, and L. M. Thatcher, secretary. The Thatcher Furnace Company employ a large force of men, and are on of the leading manufacturers of their line in the country, and their industry is one of great importance to our city furnishing employment to a large force of employees."

(*Continued on page xvi.*)

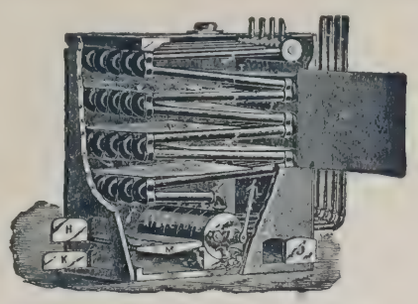


FAR BETTER AND CHEAPER THAN RED LEAD

Makes a tighter joint than red lead, that can be opened with perfect ease many years after.

Invaluable for all steam, gas and water piping, and equally useful for smearing gaskets on flange joints of meters, traps, and for bolts, screws, etc.

JOS. DIXON CRUCIBLE CO.,
JERSEY CITY, N. J.

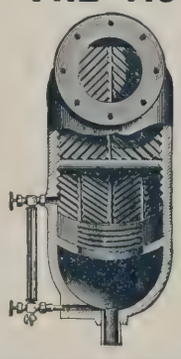


Little Wonder Sectional Hot Water Heater,

LIKE the McLellan Sectional Safety Steam Boiler, advertised in May number of HEATING & VENTILATION, is a sectional pipe heater and covered by the same patent; is the most economical heater in fuel on earth; has draft or baffle plates which cause the heat gases to travel in a zig-zag course to chimney. Thus the water absorbs a greater amount of heat than in any other heater, in fact smoke pipe is always nearly cold. Burns No. 2 chestnut coal and all other kinds of fuel; has shaking and dumping grate. Send for description and price list. Will sell State Rights or take a partner with means to increase the business.

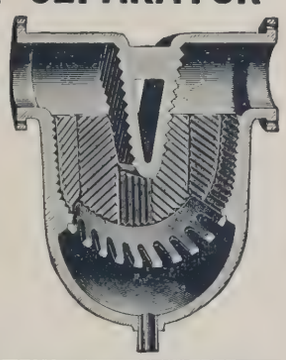
C. T. McLELLAN, PATENTEE AND BUILDER,
V. M. C. 1105 **EASTON, PA.**

THE AUSTIN OIL AND WATER SEPARATOR



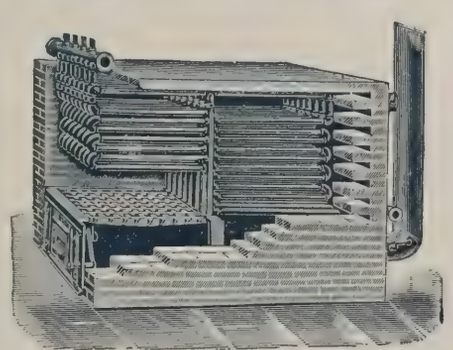
(PATENTED)
FOR
PURIFYING EXHAUST AND ELIMINATING CONDENSATION
FROM LIVE STEAM
IS INFINITELY SUPERIOR TO ALL OTHERS.

Guaranteed to separate oil from the exhaust of any type of engine. Sent to responsible parties on trial. Sold strictly on its merits. Circulars and prices on application.



AUSTIN SEPARATOR CO.
59 Woodbridge Street, West, DETROIT, MICH.

THE ELECTRIC BOILER



For Steam and Hot Water Heating

And for Steam Power.

Manufactured in Over 300 Different Sizes.

SEND FOR CATALOGUE
—TO—
THE ELECTRIC BOILER COMPANY,
23 and 25 Stillson St., and
15, 17 and 19 Achilles St., ROCHESTER, N. Y.



The Scollay Hot Water Heater

For Warming DWELLINGS, STORES, OFFICES, CHURCHES, PUBLIC BUILDINGS, &c

Also Boilers specially constructed for Greenhouses, Conservatories, Baths, Laundries, &c. . . . . .

Send for Illustrated Catalogue and Price List.

JOHN A. SCOLLAY,
70 & 72 Myrtle Avenue, *Brooklyn, N. Y*

The United States Heater Co., of Detroit, invite the trade to investigate the merits of their new thermometer by way of their latest postal traveler.

Mr. A. C. Barstow, Sr., president of the Barstow Stove Co., and identified with heating and cooking apparatus for many years, died on Wednesday, Sept. 5.

Newark, Washington and Baltimore, are the latest conquests of the W. H. Page Boiler Co., several "Volunteers" and "All Rights" having lately been sold there.

Our Chicago office desires to thank the Western Society of Engineers for an invitation to attend the excursion to the main channel of the sanitary district of Chicago, Saturday, Sept. 8.

R. D. Jackson is now nicely located at 89-91 Centre street, where he is showing samples of Van Auken valves, Belfield pressure regulator, electric boilers, etc. Mr. Jackson is quietly working up a nice trade on the different goods handled by him.

A new Addition, 75 by 148 feet, two stories & basement, of brick, has just been completed by Eaton, Cole & Burnham, at Bridgeport, Conn., as a warehouse for their finished product. All shipments will be made direct from the factory in the future.

Merchant & Co., of Philadelphia, have erected a large two-story building, 50 by 100 feet, for the manufacture of their Star ventilators. One hundred and sixty Star ventilators were recently shipped to the Pacific coast for use in a new hospital at San Francisco.

We are indebted to the Plumbers' Trade Journal for a complete list of the Knights of Tabasco of the United States, which has been compiled by James Heatherton, Jr., editor of that journal, who will send it free to the trade.

Thomas W. Garing, formerly with Fuller and Warren Company, Chicago, accepted, on August 1st, the position of superintendent of the furnace department of the William Miller Range and Furnace Co., of Cincinnati. Mr. Garing has had twenty years' experience in this line of work.

Major C. F. Seaman of Hamburg, Pa., on August 9 purchased the interest of Mr. Adams in the Adams Radiator & Boiler Co., of Reading, and the board of directors met, electing him a director of the company. The board also elected him president and general manager of the company.

We are favored by the Detroit office, corner Clifford and Park place, Chicago, with a copy of a catalogue just issued by them describing the Johnson Electric Service Company's system. This company is an old one, and has many testimonials as to merit. The catalogue will be sent on application.

Two No. 26 Gorton patent side-feed hot water boilers will be used for heating the Fogg lodging house recently erected on Fifty-third street, near Eleventh avenue, New York. The installation is being made by Messrs. Gillis & Geoghegan, of New York, and is a notable one on account of the great size of the boilers.

In a recent issue of the Binghamton, N. Y., Morning Message, Gaylord & Eitapenc had a full-page advertisement on their Imperial boiler. The paper also gives a little history of their business, which was established in May, 1889, and has constantly grown, so that to-day they are the leading house on the southern tier.

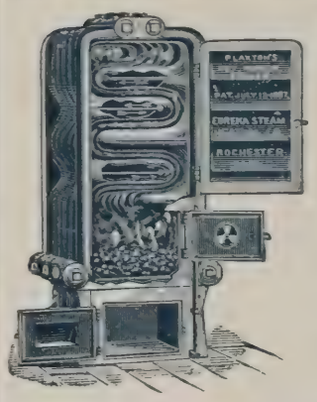
The New York office of the Detroit Lubricator Co., W. A. Russell, manager, will carry a full line of valves hereafter, stock rooms having been secured. They are now in position to fill all Eastern orders immediately. Mr. Russell has been remarkably successful in introducing these goods, and they are being received with much favor by the trade.

Crane & Co. have for a sign in front of their office at 130 Centre street, New York, an immense valve that immediately attracts the eye of the passerby. They have also two immense steam pipes attached, upon which a sign reads: "Sizes 18 to 24 inches diameter; all sizes cut to sketch." Manager Uhlig says things are coming their way all right, and that their trade is constantly increasing.

The American House Heater Co., Elmwood, Conn., has been incorporated; capital, $100,000. The directors are W. L. Shepherd, Charles W. Hills, P. S. Barnes, John W. Crane, George V. Buckley, A. H. Matatall, and Morton Belden; president, Charles W. Hills; vice-president and general manager, P. S. Barnes; secretary and treasurer, Morton Belden. Their new factory is now under way, and will be located south of the depot, near the Whitlock Coil Pipe Company.

Steam is coal—coal is money, says the New York Fireproof Covering Co., in a late circular to the trade showing the advantages of rock wool as a covering for steam pipes. The company say they have been very successful in introducing these goods, and the remarkable satisfaction they are giving should lead the trade to make a thorough investigation before purchasing pipe coverings, that one may be secured which saves the most coal and which once applied is always applied.

A neat catalogue is that just received from the Powers Regulator Co., 36 Dearborn street, Chicago, and which has been issued so that their system for schools, which is becoming more popular daily, may be put before boards of education in handy, compact form. Temperature regulation is described thoroughly, and the benefit of their automatic system set forth plainly as a fuel saver. Cuts of the First Ward school, Long Island City, N. Y., and the Ray school, Hyde Park, Chicago, are shown, and "the way it is done" minutely explained. Every school board should send for this catalogue and give it careful consideration.



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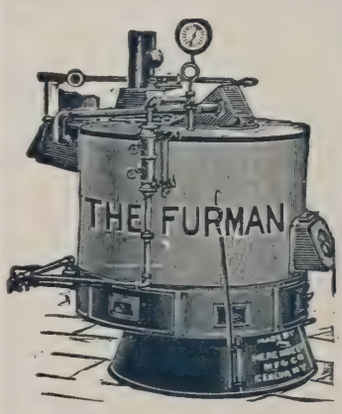
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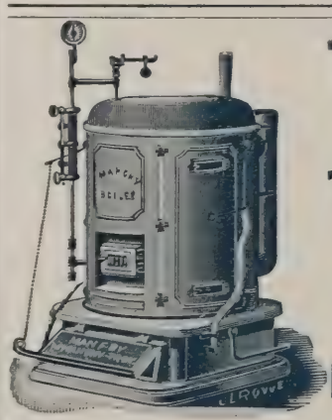
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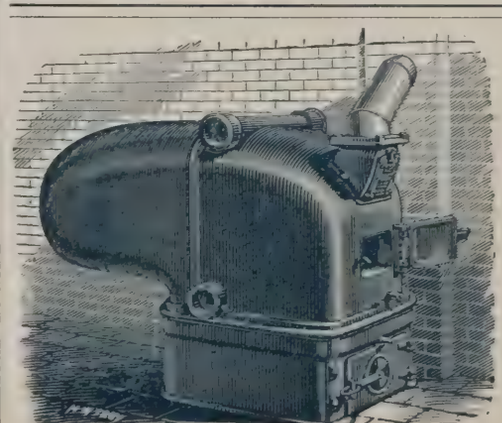
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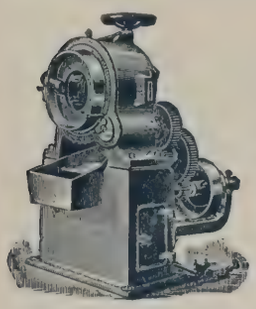
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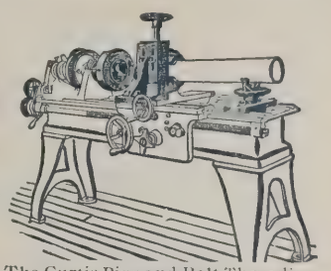
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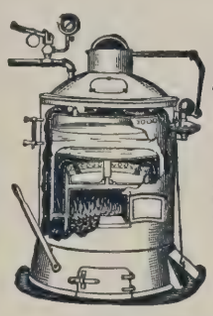
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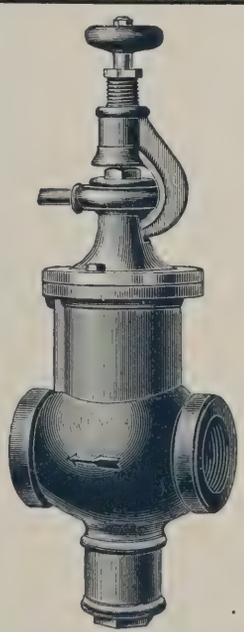
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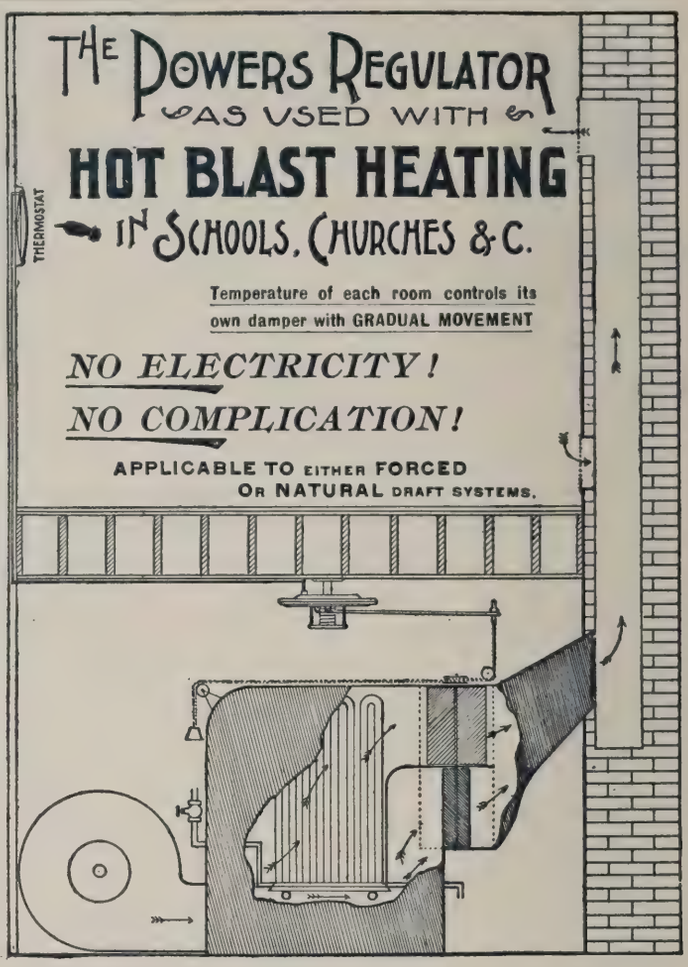
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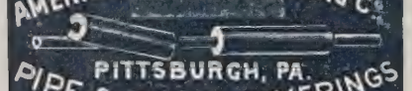
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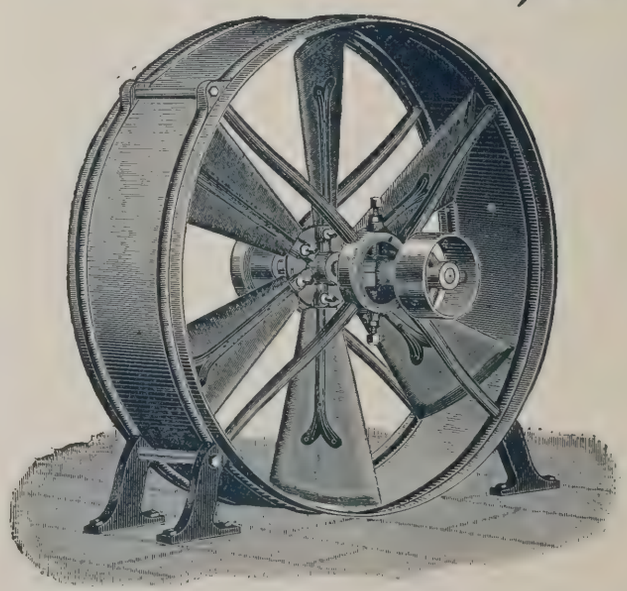
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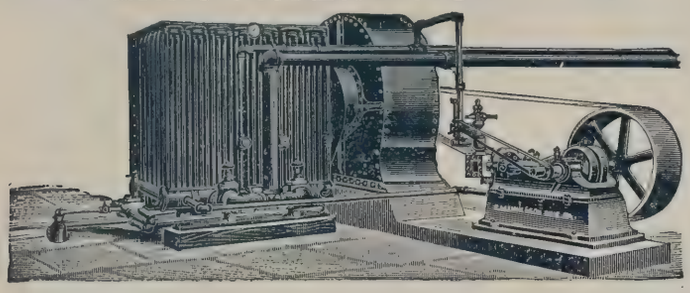
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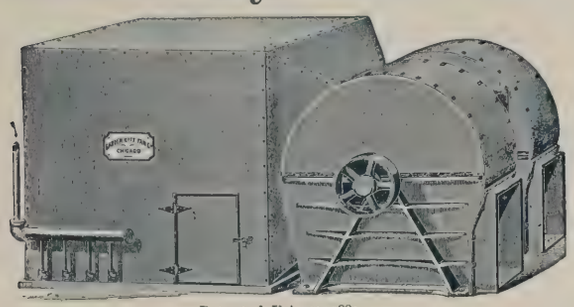
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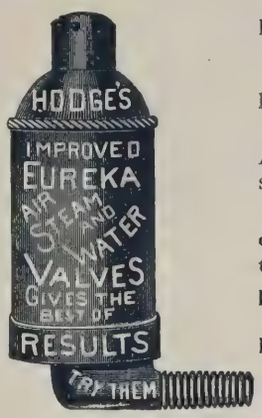
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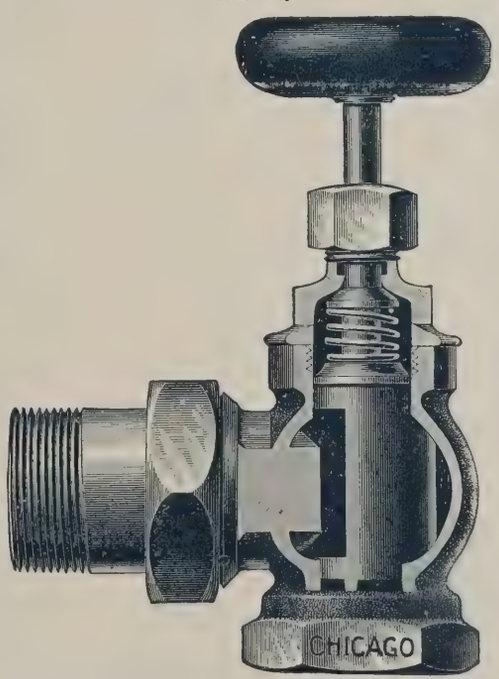
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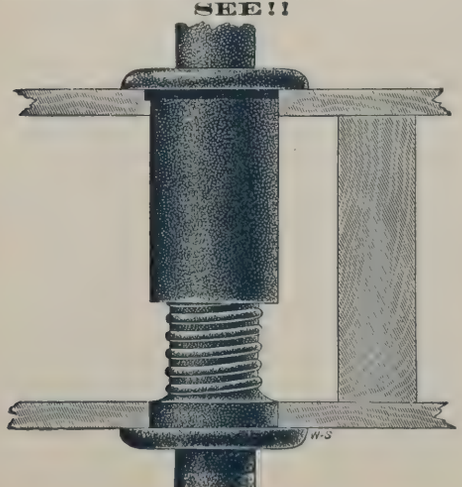
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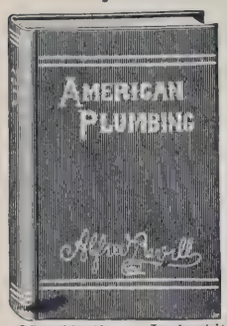
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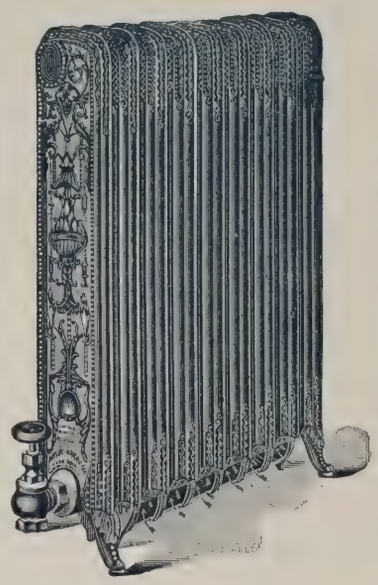
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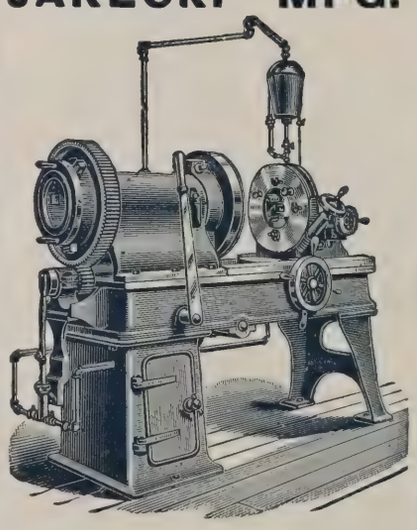
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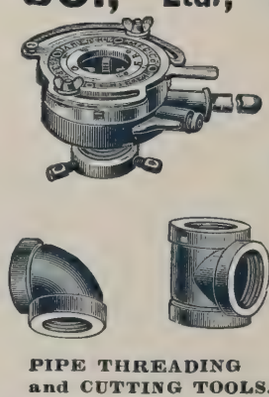
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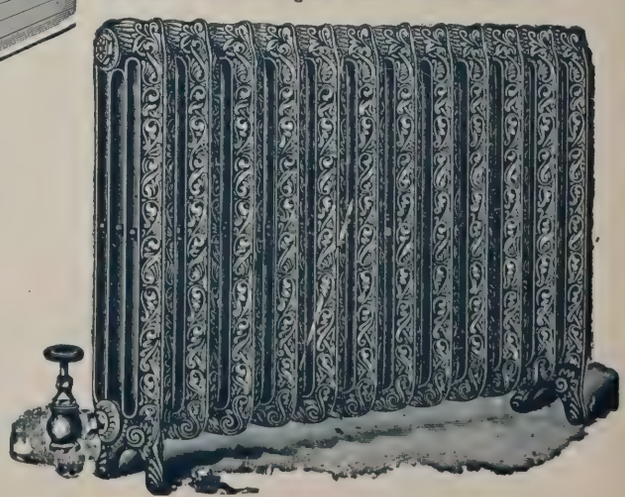
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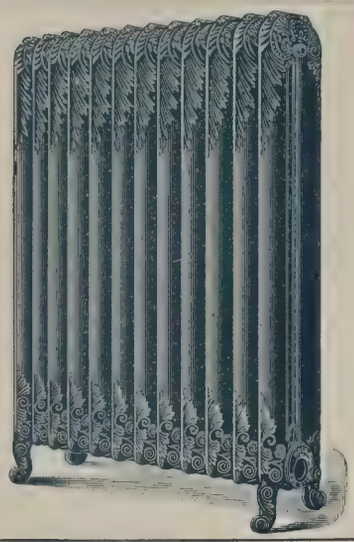
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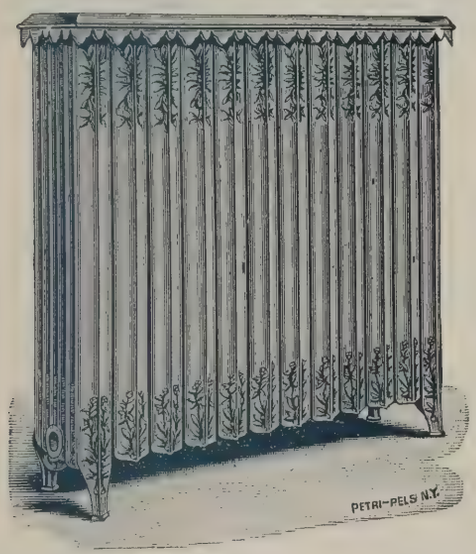
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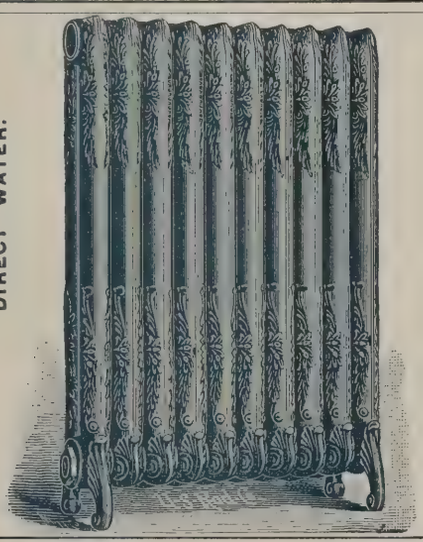
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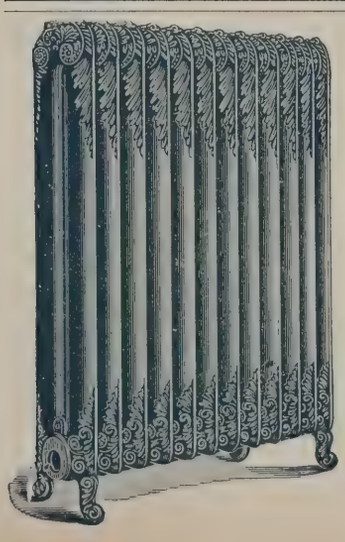
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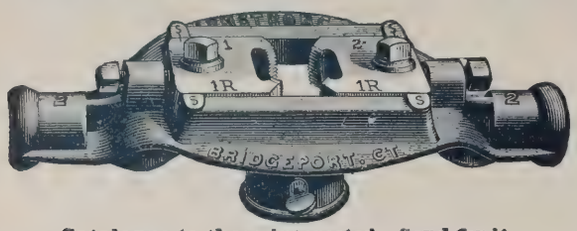
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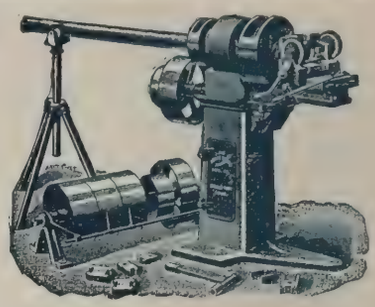
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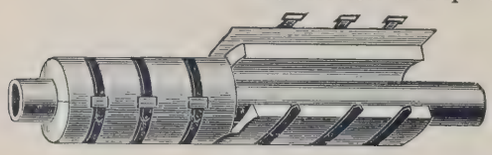


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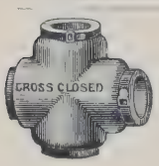
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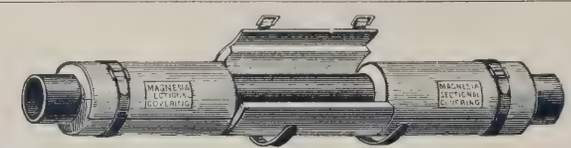
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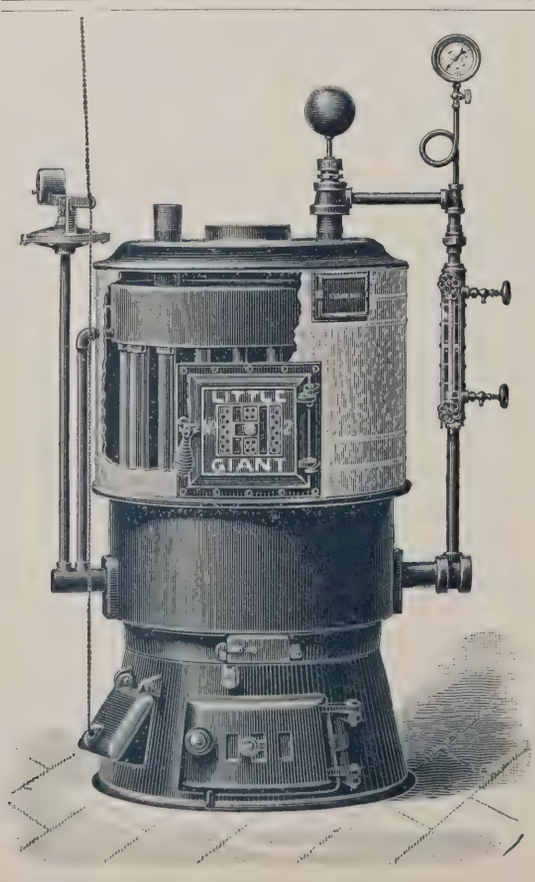
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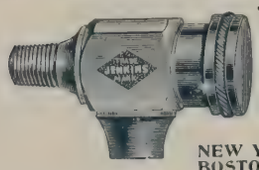
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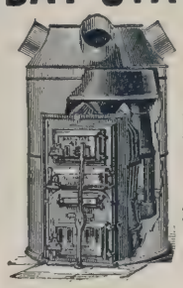
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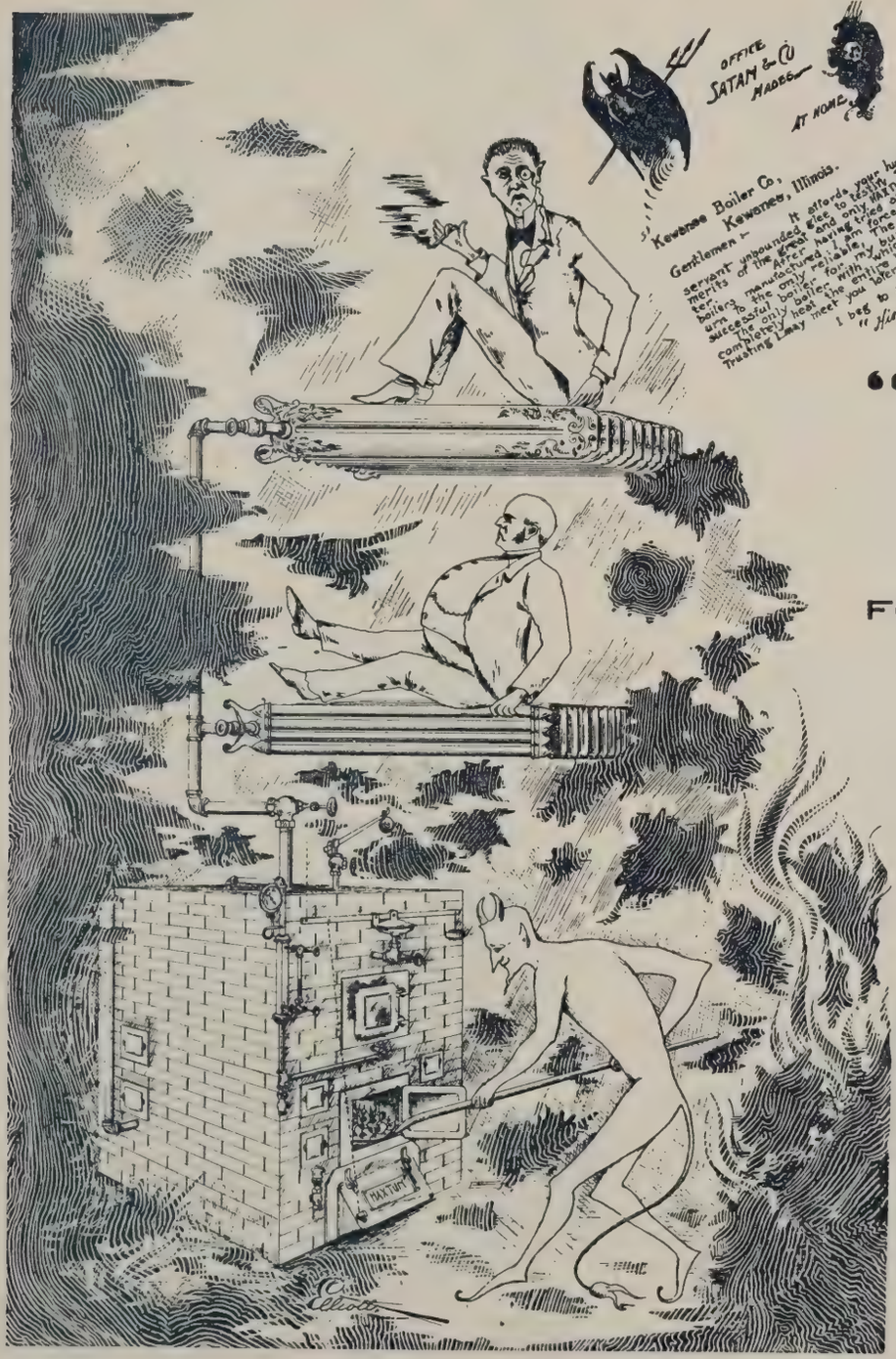


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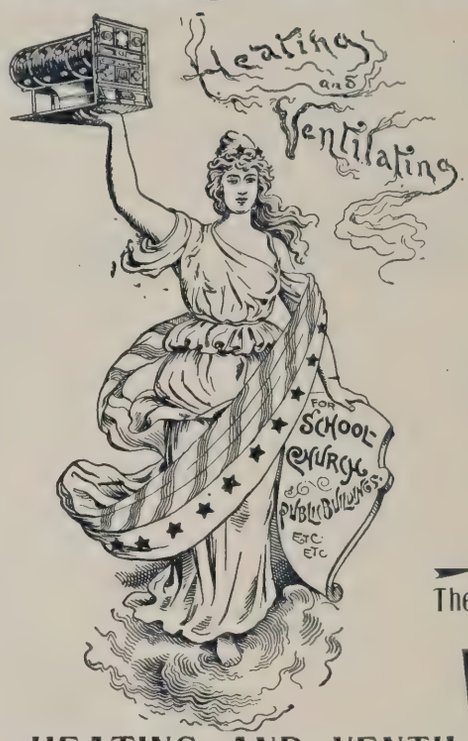
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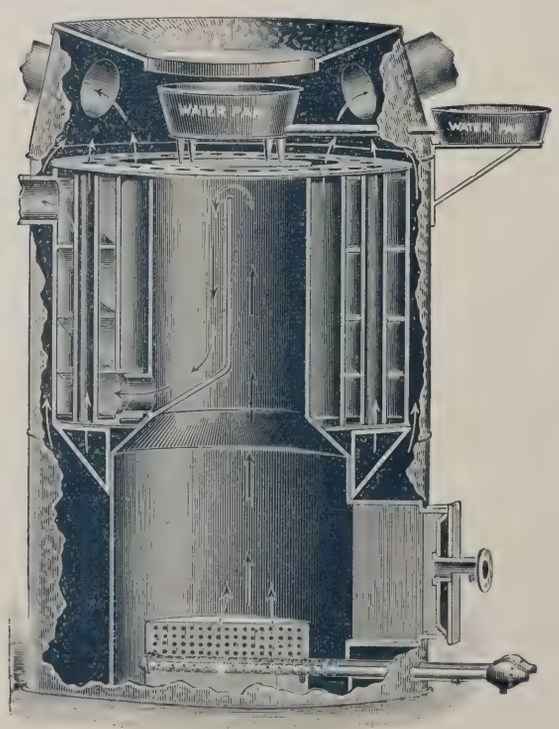
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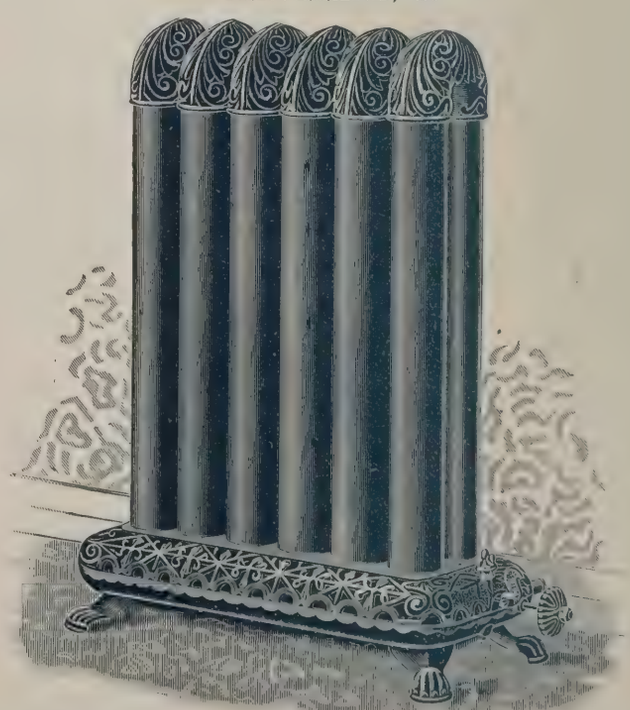
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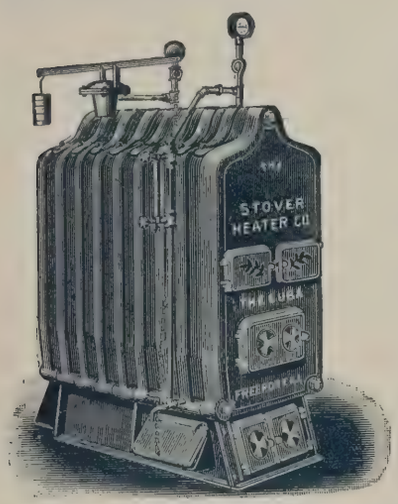
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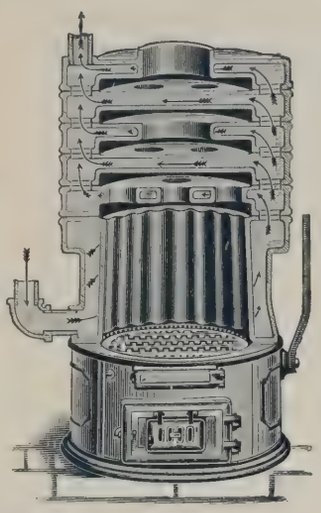
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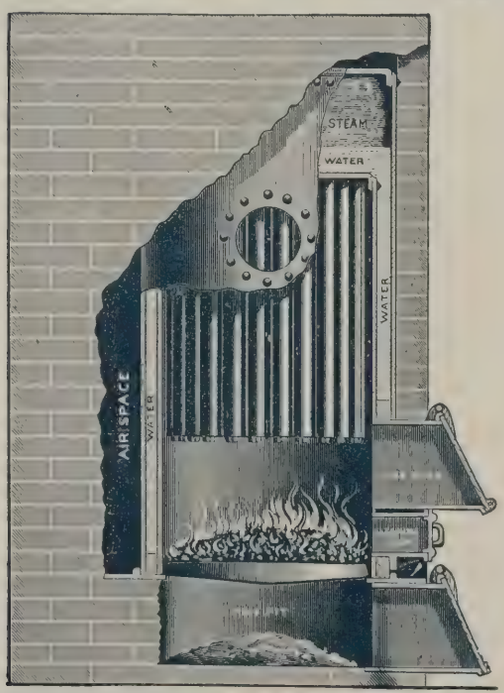
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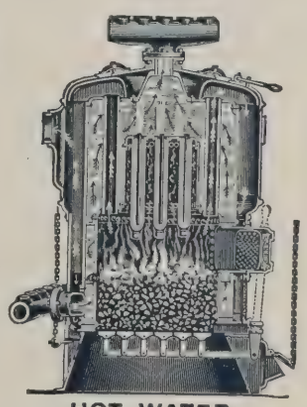
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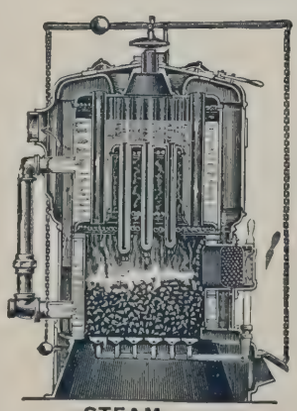
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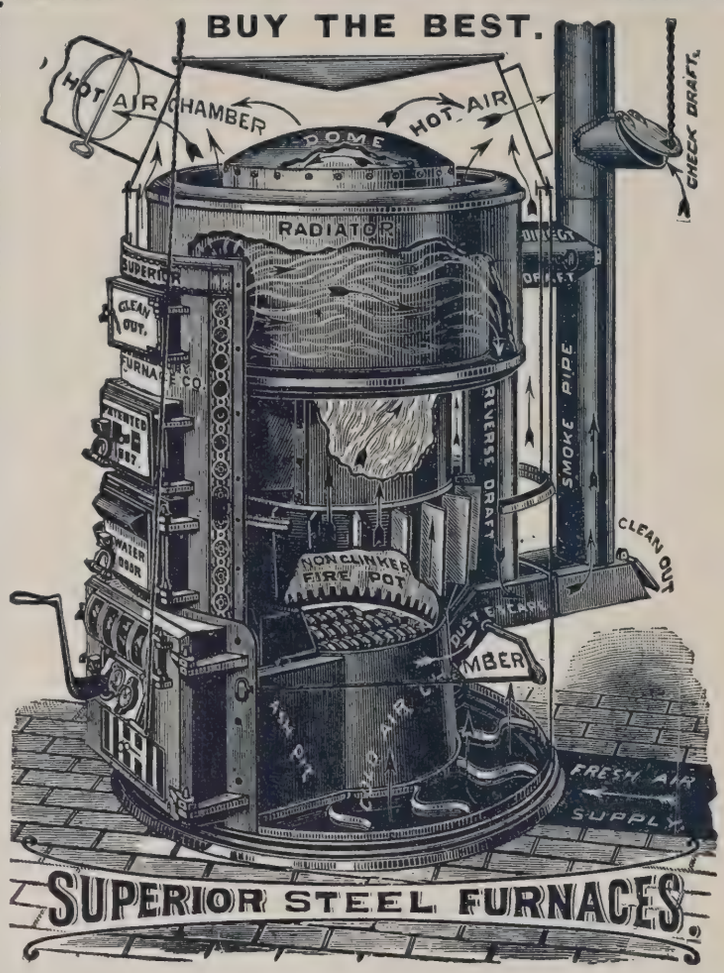
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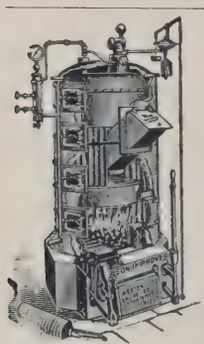
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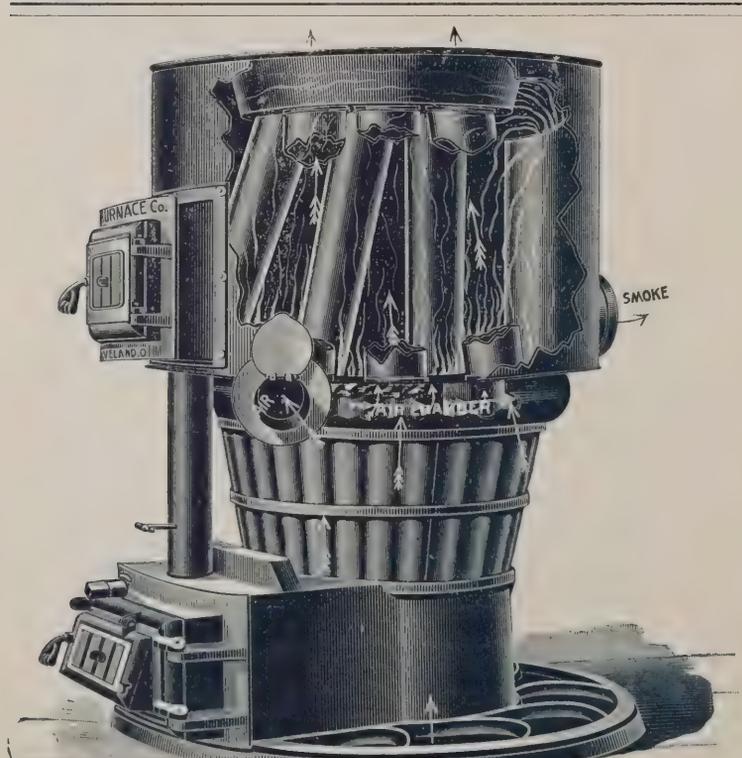
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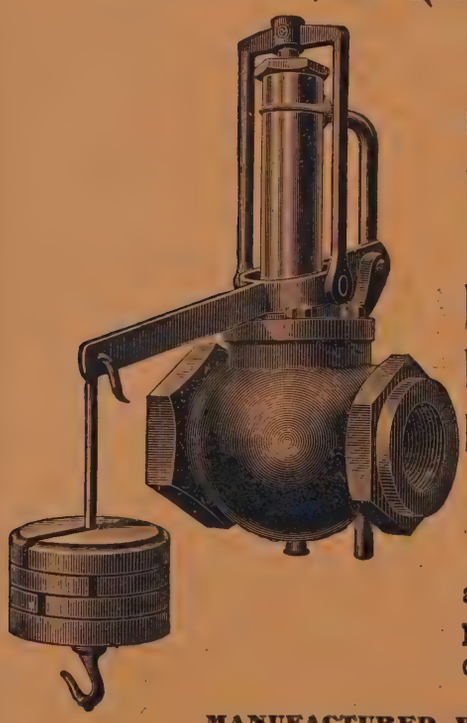
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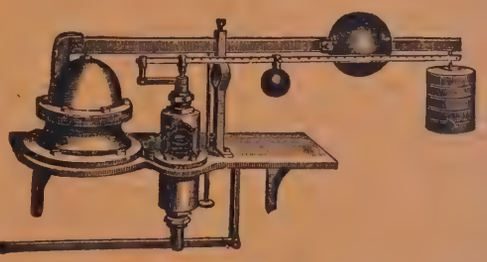
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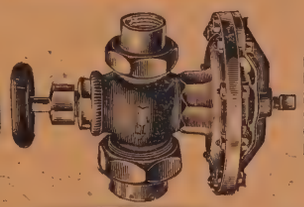
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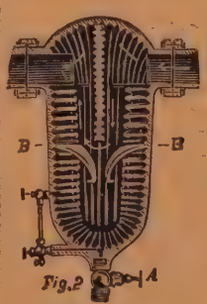
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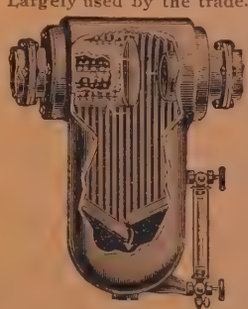


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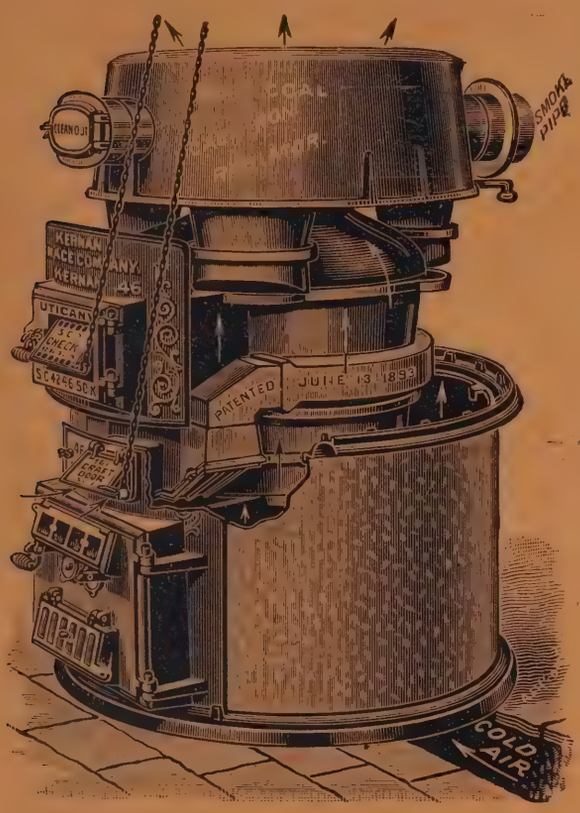
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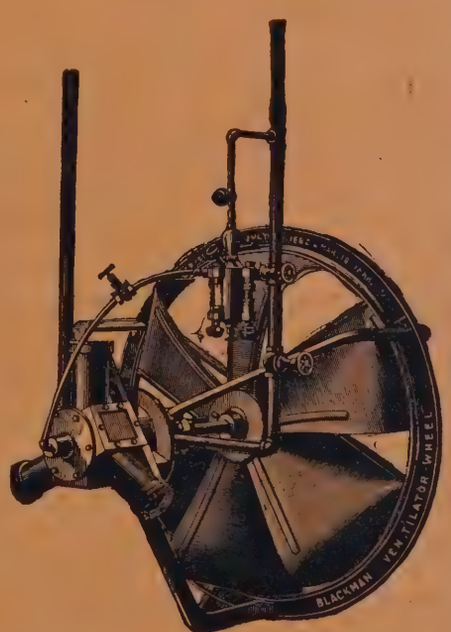
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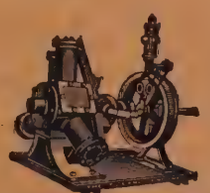
Electric Motor attached to the Shaft of the Blackman. (Front View.)



The Blackman. (Diagonal View.)



The Blackman. (Back View.)



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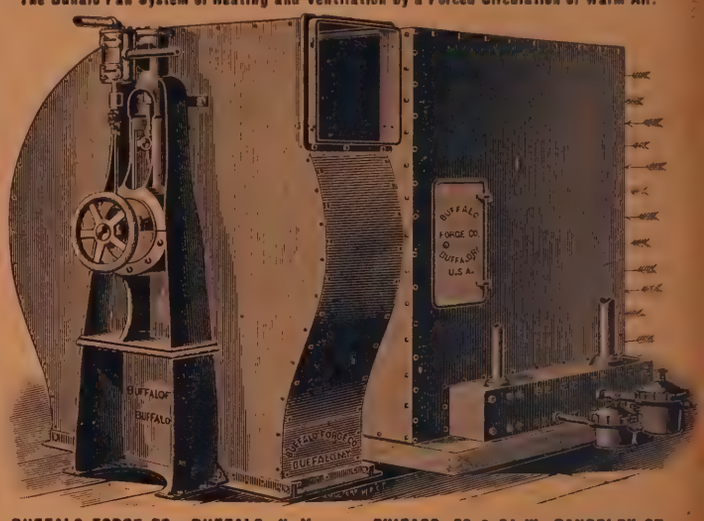
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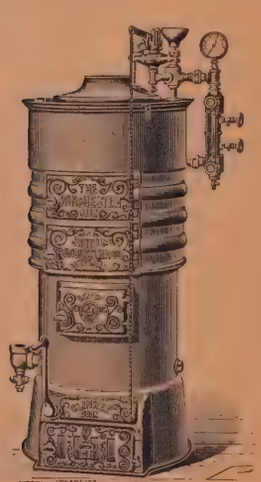
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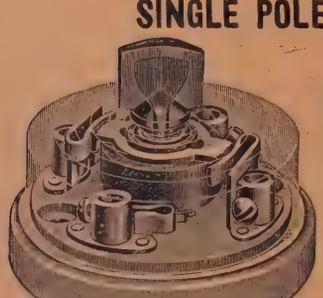
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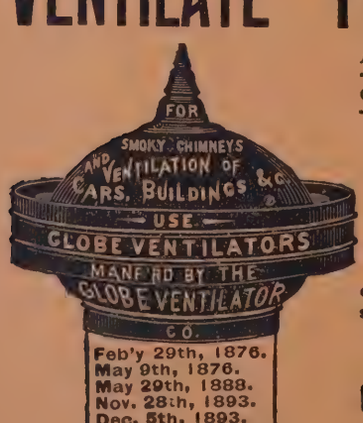
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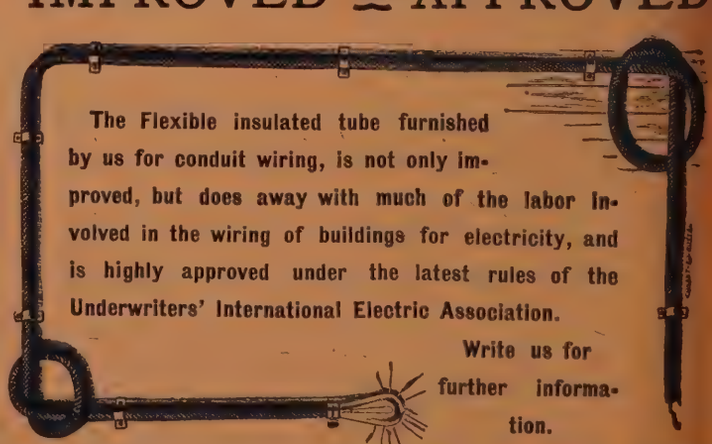
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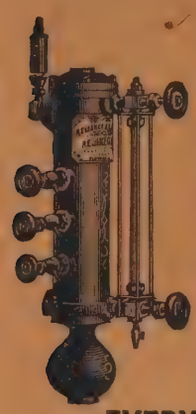
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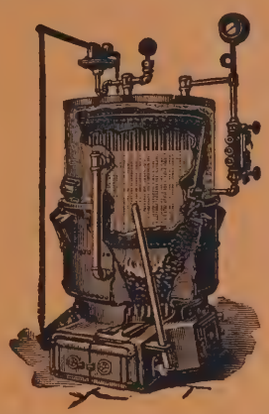
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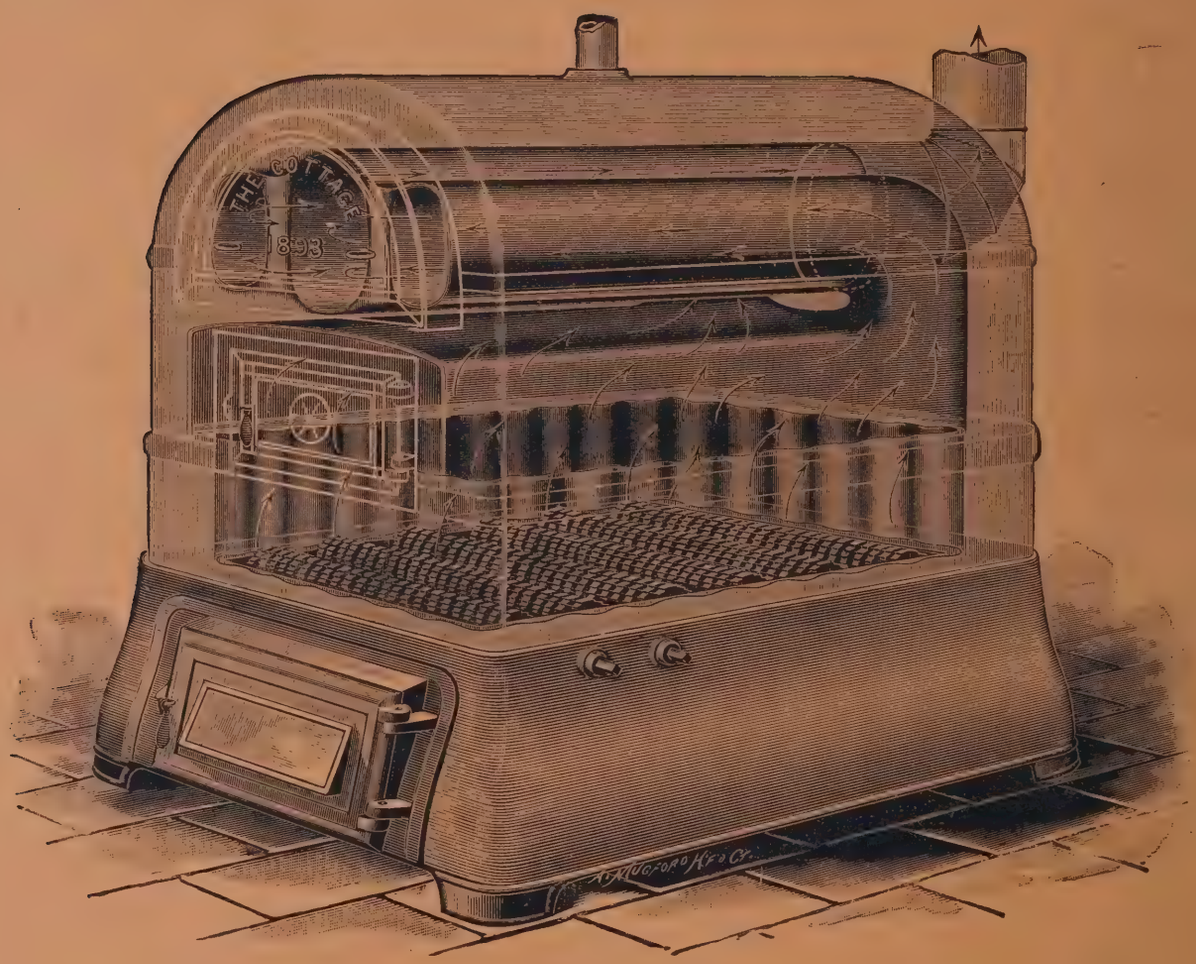
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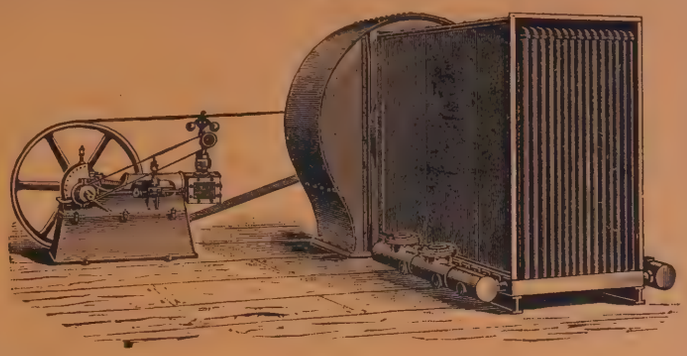
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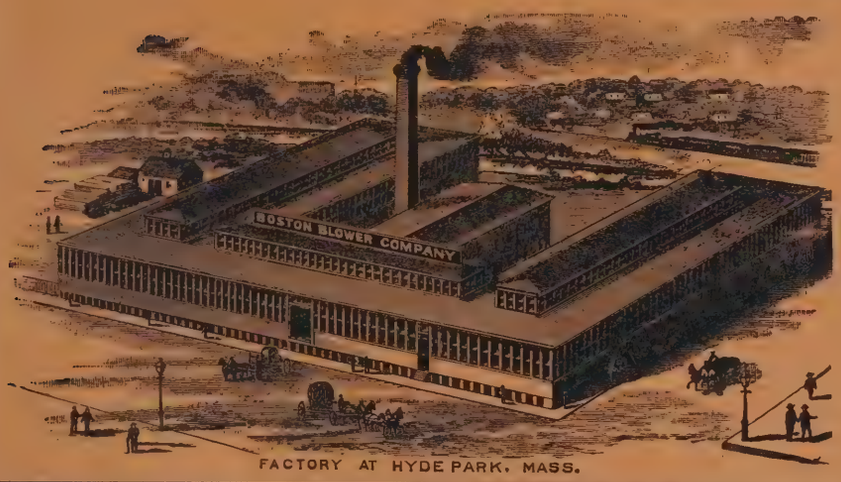


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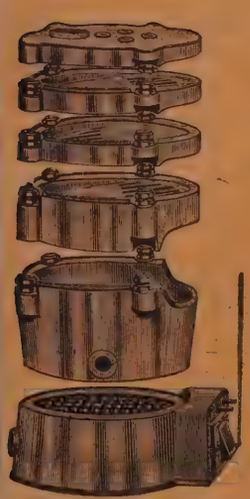
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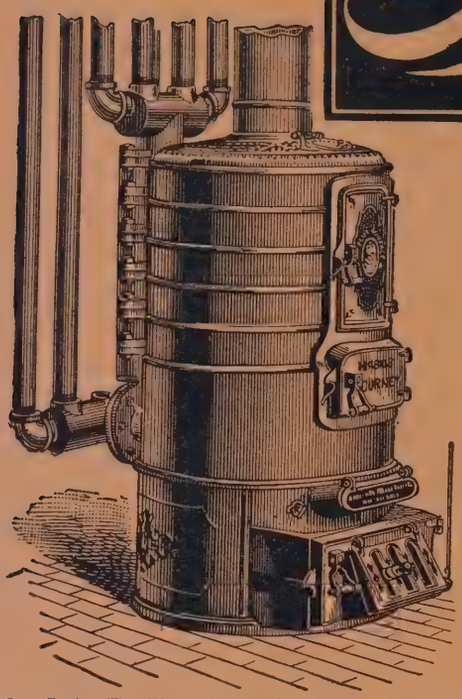
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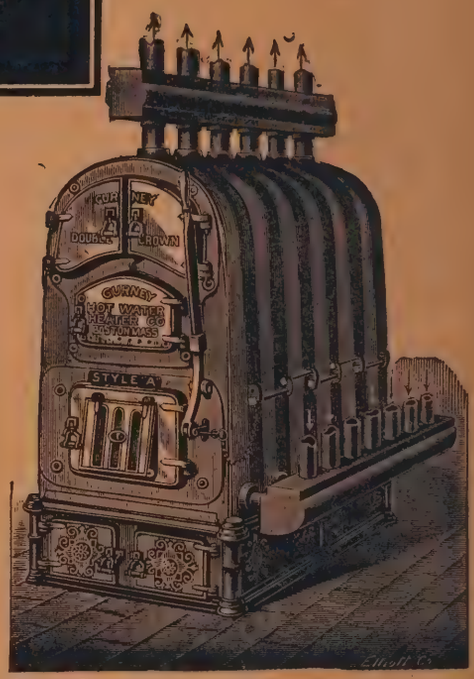
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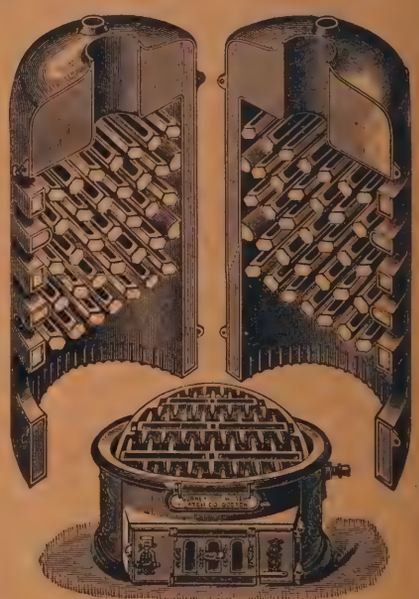
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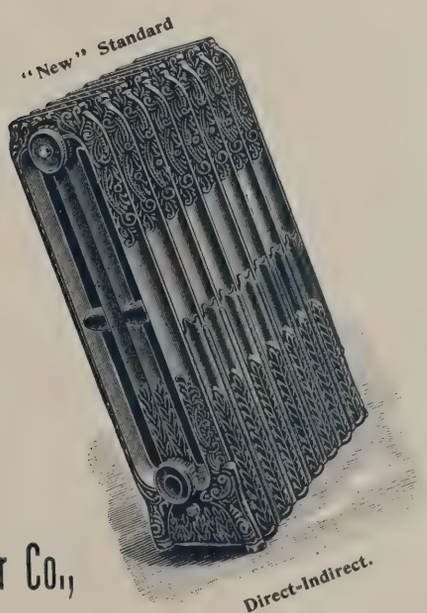
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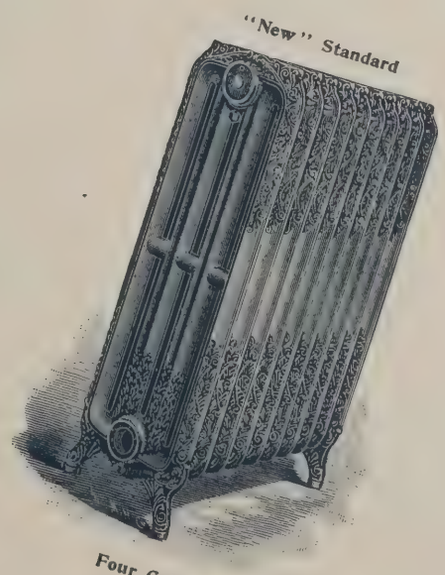
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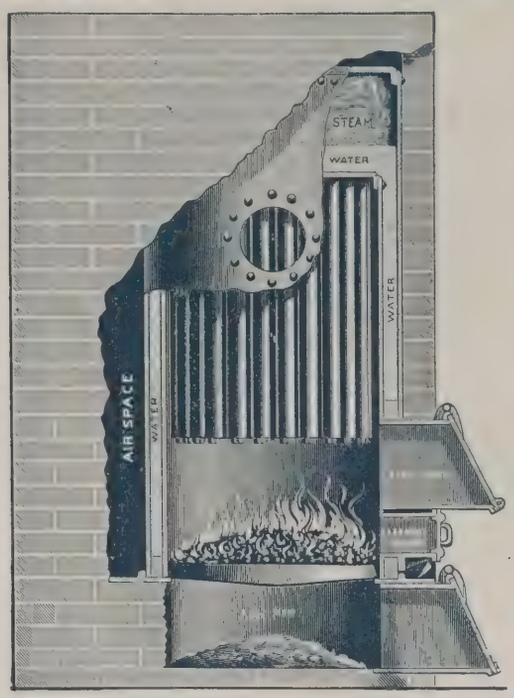


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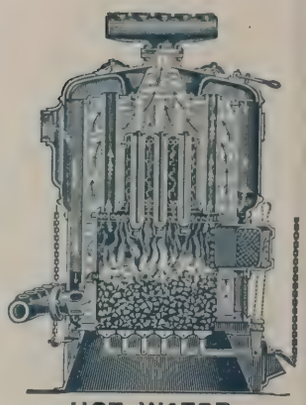


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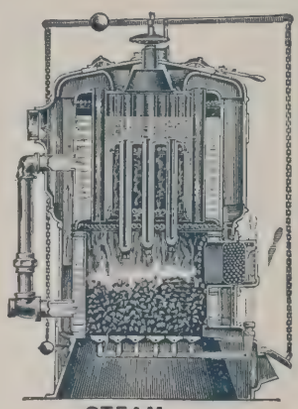


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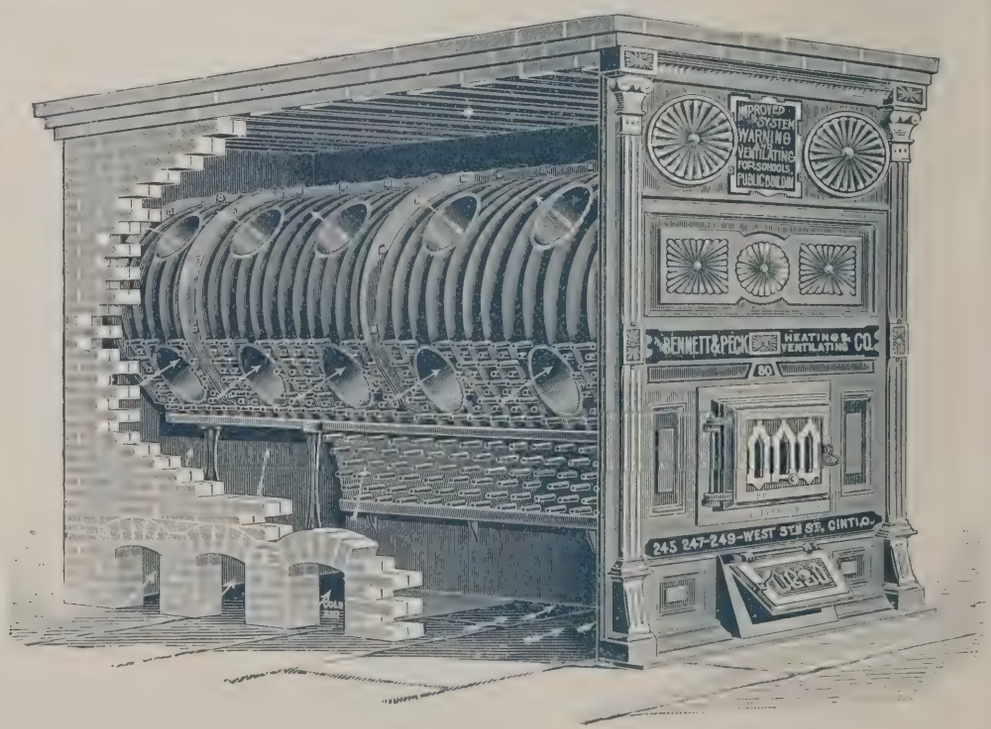
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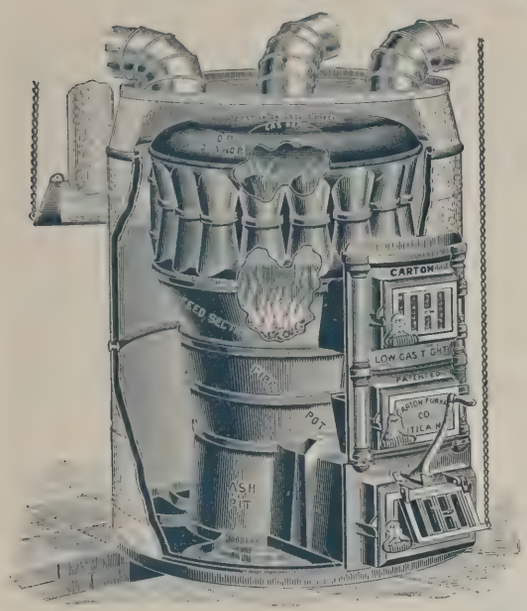
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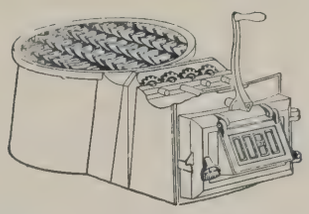
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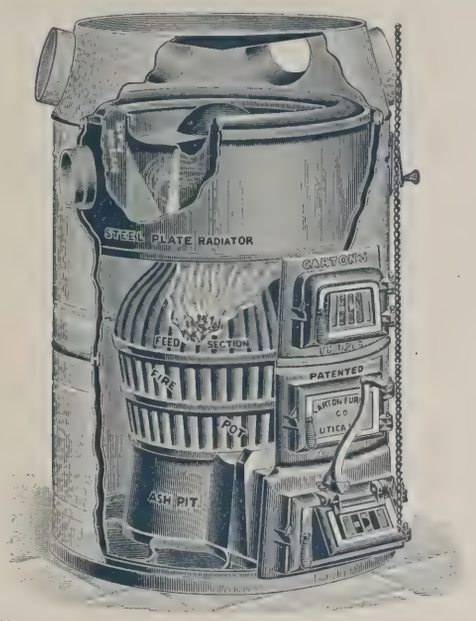
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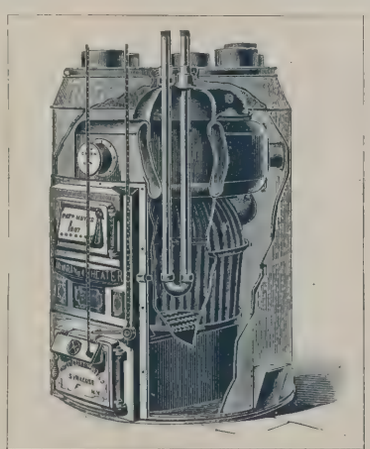
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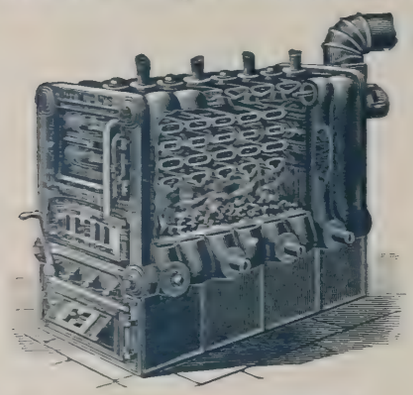
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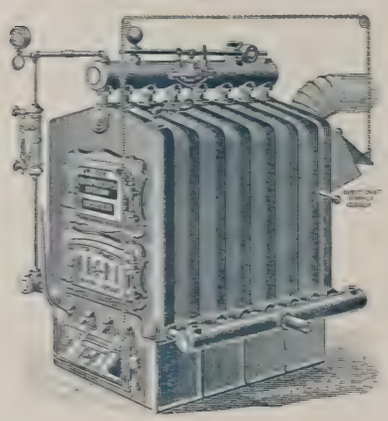
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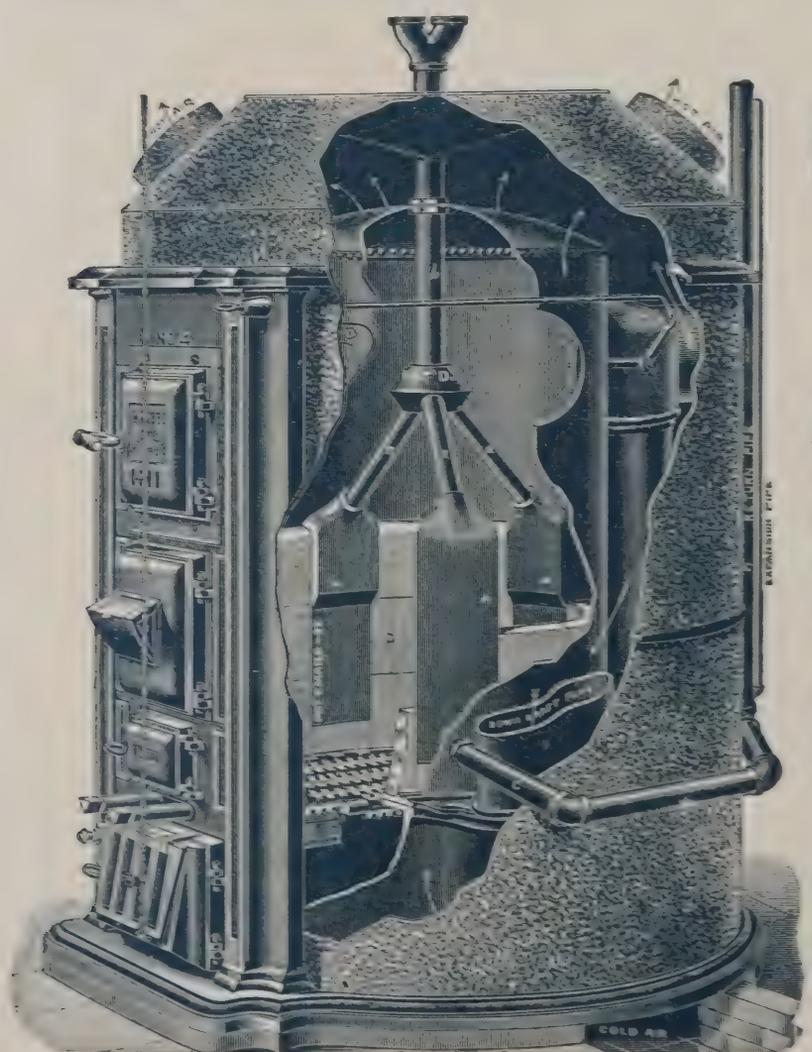
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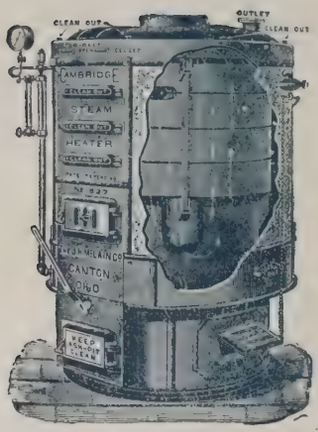
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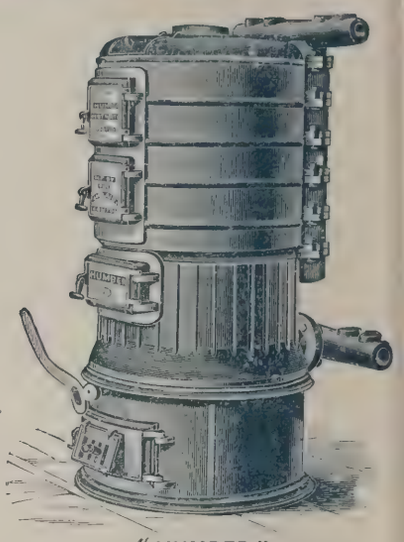
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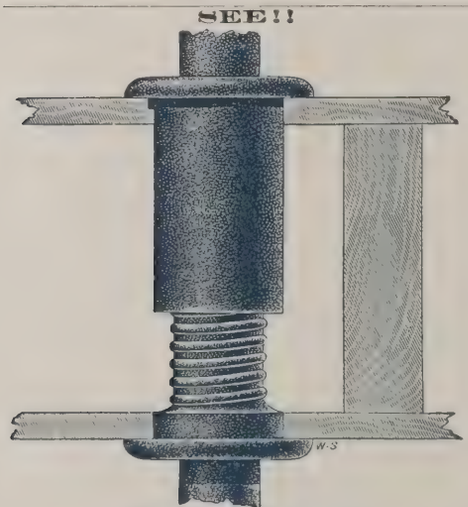
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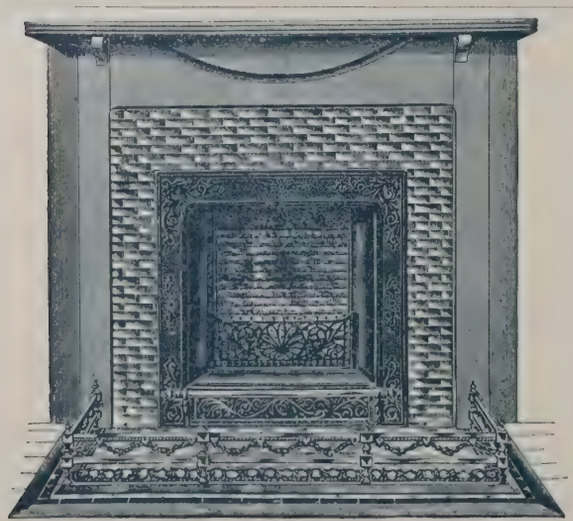
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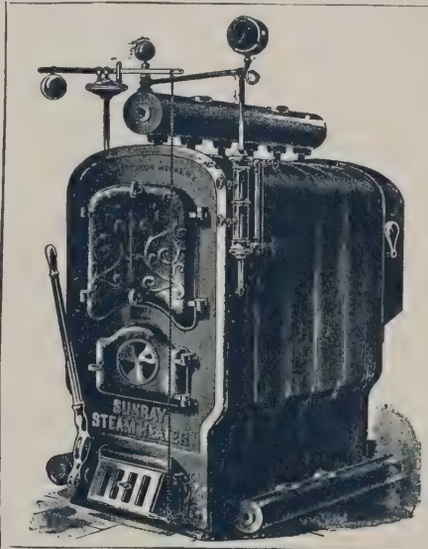
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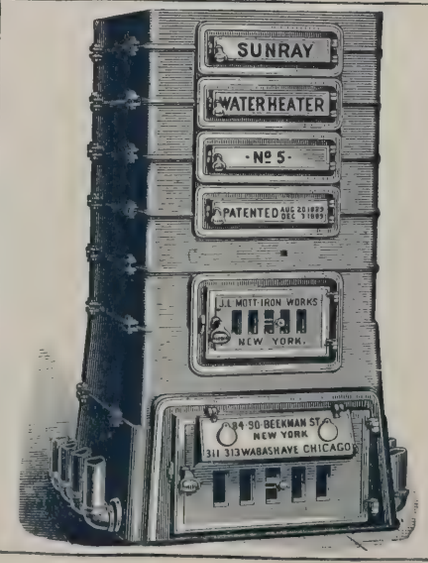
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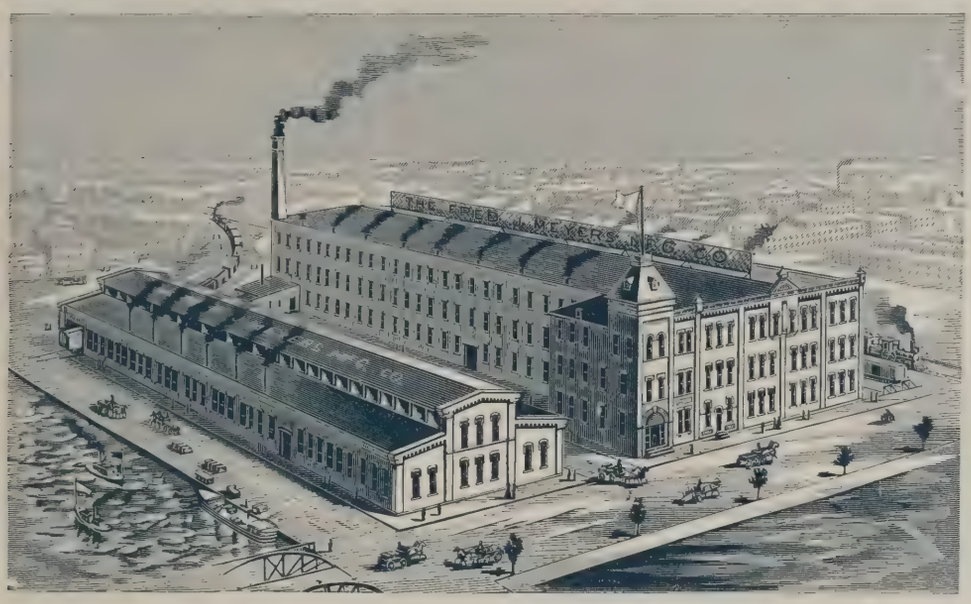
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This Building is Heated and Ventilated by

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GENTLEMEN: We have this day given the heating plant you put in our new works a test, and find that it fully meets all the requirements of the contract, and is in every particular as represented by you. The guarantee you made us when you sold us the plant is a strong one, and we hardly expected the same fulfilled, yet we must now say that the apparatus is even stronger and more powerful than the guarantee. We cannot say too much in praise of your man, whom you sent here to complete the contract. He certainly understands his business thoroughly, and has done exceedingly well in every particular.

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A Saving to Manufacturers.
Circulation of Exhaust Steam without Back Pressure.
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The most economical system of heating by Steam.

NOISELESS. **QUICK.** **POSITIVE.**

The system as may be seen in operation at our office can be easily applied to any old Steam Heating Plant.

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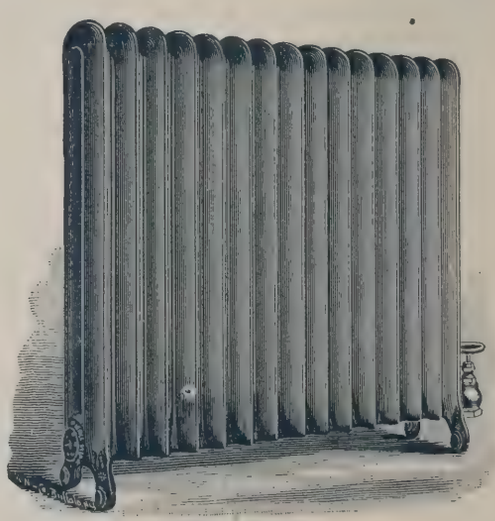
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Heating and Ventilation

NEW YORK. (Copyright, 1894.) October 15, 1894. (All rights reserved.) CHICAGO.

Direct and Indirect Steam System of Residence Heating.

The low pressure steam direct-indirect system of heating recently installed in the residence of Mrs. E. J. Walcott of Utica, N. Y., replaces a hot air system of heating, the old furnace being located in the furnace room shown on the cellar plan. The system is designed to heat the building in the coldest weather with a pressure not to exceed five pounds at the heater, to which the water of condensation from radiators and mains is returned.

Steam is furnished by a No. 23 Royal safety sectional steam heater manufactured by Hart & Crouse, Utica.

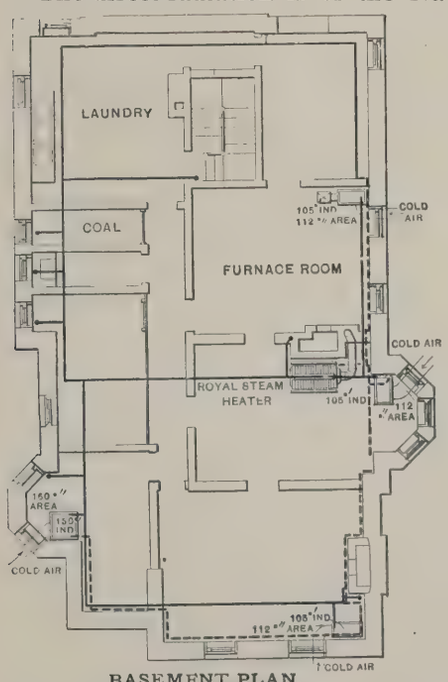
The heater is provided with improved sectional clinker-clearing shaking grates, direct draft and return flue, draft-damper, and all other necessary fixtures and fittings, and is set on a brick foundation. It is covered with asbestos cement felting to prevent radiation of heat into the cellar, and is connected to the chimney by a 10-inch galvanized iron smoke connection with round elbows and all necessary dampers.



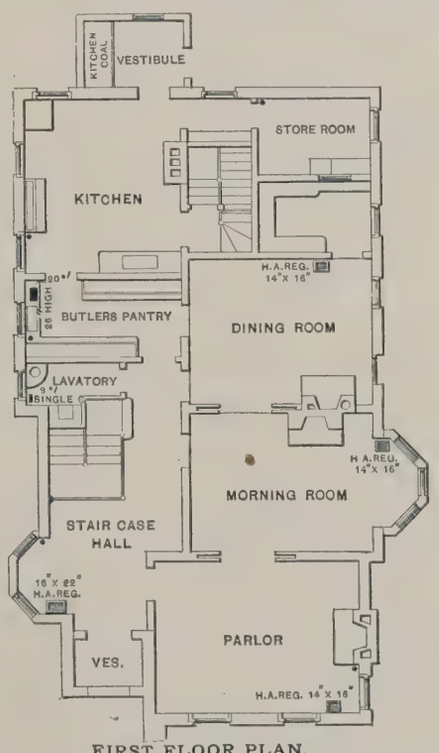
RESIDENCE OF MRS. E. J. WOLCOTT, UTICA.

The direct radiation is of the National pattern, manufactured by the American Radiator Co., 92 Centre street, New York, the indirect radiators, being of the Perfection pin cast iron sectional pattern manufactured by the same company.

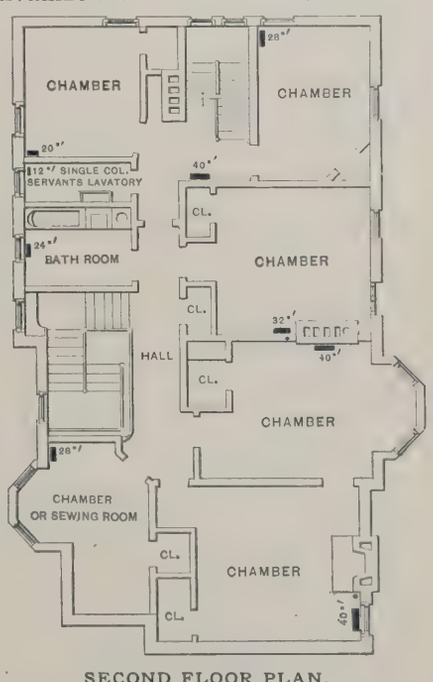
As will be seen from the accompanying plans, the parlor, morning room, dining room, and hall are heated by indirect radiation, each radiator having 105 square feet of radiating surface, with the exception of the one for heating the hall, which has 150 square feet of surface. The other rooms of the house are heated by direct radiators 38 inches high, the amount of surface in which is marked on the plans.



BASEMENT PLAN.



FIRST FLOOR PLAN.



SECOND FLOOR PLAN.

All fittings are of heavy pattern gray cast iron, no malleable fittings or union couplings being used in the work. All horizontal mains are supported in the cellar by adjustable cast iron hangers secured to the floor beams eight feet apart, the mains falling one inch in ten feet from the point above the heater to the extreme end of the main, where they are relieved by taking a connection back to return of heater. The direct radiators are arranged on the one-pipe system, the indirect stacks being placed on the two-pipe system.

Where pipes pass through walls, floors or ceilings, the openings are covered by adjustable nickel-plated floor or ceiling plates, properly secured in place with the necessary tin floor and partition tubes. A nickel-plated wood wheel radiator valve of heavy pattern is placed on the steam connection to each direct radiator, the steam and return connections to each indirect stack being provided with heavy valves of full size. Both direct and indirect radiators are provided with the Eureka automatic air valve, manufactured by Hodge Bros., of Boston.

The indirect stacks are incased in galvanized iron with a 12-inch air space above the stack and an 8-inch air space below it, the stack casings being connected to the register boxes by means of tin hot air pipes having

an area of 1½ inches for each foot of radiation in the stack. The galvanized iron cold air supply pipe is connected to the bottom of the stack casings and is fitted with a damper and a one-half inch mesh galvanized wire screen over the out-end. Its area is three-quarters that of the hot air connection.

The registers used are of the sizes marked on the plans and have the same area as the hot air pipes. They are of nickel plated finish, manufactured by the Tuttle & Bailey Mfg. Co., of New York.

The apparatus is guaranteed to be noiseless in operation and of ample capacity to heat the building in the coldest weather with ordinary firing and attention and with a proper size and quality of fuel.

Smoke.*

BY W. H. BLAUVELT.

What is smoke, and how is it formed? Although smoke in general may be composed of a large number of gases, vapors, and finely divided solids, we are considering only the smoke from bituminous coal; this may be defined as that portion of the products of combustion of the hydrocarbons in the coal which is visible, namely, solid carbon in a finely divided state, or soot, and volatilized but unburnt hydrocarbons.

Many hydrocarbons, when heated to suitable temperatures, are decomposed, with formation of a new hydrocarbon and solid carbon in a fine state, which; unless there is present a supply of air at a proper temperature for its combustion, passes off as soot. Smoke may also be formed by hydrocarbons while in combustion striking against a cool surface, which lowers the temperature below that at which combustion can be sustained, and the flame is "put out," with the production of smoke as the result.

A third cause is the distillation of the hydrocarbons without alteration or even partial combustion. It is this that gives the yellow tinge to smoke, and the greasy quality, which is one of its most disagreeable features. From the point of view of thermal economics, the formation of smoke is not of such serious importance as many imagine. In ordinary cases the actual loss of combustion amounts to but a small percentage of the energy in the coal; in its denser forms it is important because it is the indicator of seriously imperfect combustion, and because carbon is visibly wasted. The attempt should be, therefore, to prevent its formation rather than to "consume" it, at the expenditure of mechanical or thermal energy.

The causes for the formation of smoke serve to indicate the means for its prevention. The deposition of solid carbon from decomposed hydrocarbons and the escape of unburnt volatilized hydrocarbons, may both be prevented by their intimate mixture at the moment of combustion with the proper amount of air, preferably preheated, so that each particle of carbon or hydrocarbon may find oxygen adjacent to it for its combustion. The "putting out" of the flame by its contact with cold surfaces may only be overcome by permitting the combustion to be nearly complete or at least thoroughly established before the gases are allowed to impinge upon the boiler shell or other cool surface. While it is very difficult to carry out these conditions with solid fuel, gas easily lends itself to them, and by their proper application all smoke can be prevented from gas-fired boilers. The mistake usually made in applying gas to boilers is the attempt to imitate the conditions of a solid coal fire, it being forgotten that the gas is employed in order to overcome weak points essential to the use of solid fuel.

In some applications of gas recently made to return tubular boilers by the writer, a careful use of the above principles in the light of previous less successful experience, resulted in the prevention of all smoke and in an increase of the evaporative capacity of the boilers of over twelve per cent, as compared with the results from the same coal burned on the grate. At the same time there was a saving of about fifteen per cent in the amount of coal used. The air for combustion was not preheated, and the temperature of the waste gases was 700 degrees or more, as the boilers were too short for the most economical work. Had hot air been used, of course this high stack temperature would not have been a source of serious loss.

The mixture of the gas and air was made as prompt and perfect as possible by a special arrangement of the parts, and inflammation was thoroughly developed in a brick chamber below the boilers. This was so arranged that but little more than the products of combustion reached the shell of the boiler, and at the same time the temperature at which combustion took place was kept high by the reflected and radiated heat from the walls of the chamber. For successful boiler firing it is essential that the mixture of gas and air should take place as soon as possible after they enter the combustion chamber. Frequently they are introduced in parallel stream, but even if these streams are small, the gas and air often travel quite a distance with but little mingling of the current.

*Abstract from a paper read before the Engineers' Society of Western Pennsylvania.

A chemist has invented a sensitive paint, which is a bright yellow at the ordinary temperature, but upon being brought into a warmer atmosphere, it changes color gradually, until at 220 degrees it becomes a bright red. It returns to its original color upon cooling, and may be heated with the same effect over and over again. It is suggested that this paint may be used with advantage to detect a rise in the temperature of the frictional working parts of machinery.

Belting.

BY J. L. BIXBY, JR.

The following formulas, which I have found especially useful in determining the size of belts for use in hot blast work, apply to belts encircling one-half the circumference of the pulley. The transmitting power of a belt decreases in direct ratio to the decreased belt contact. If the belt encircles but one-quarter of the pulley it will transmit but one-half the amount of power given by the following formulas, or the belt will have to be twice as wide to transmit a given power. The amount of belt contact to be accepted is the amount on the small pulley, being the least. The proper tension for a single leather belt is from 40 to 50 pounds per inch of width, and for double belts 75 to 80 pounds.

In the formulas I is the tension in pounds, W the width of belt in inches, V the belt velocity in feet per minute, R the revolutions per minute, N the horse-power that single leather belt will transmit, S the maximum strain per inch of width, HP horse-power transmitted, D the diameter of pulley in inches, C the circumference of the pulley in feet, B the width of single leather belt required.

C is approximately one-quarter of the diameter in inches. Taking slip of belt into consideration this is sufficiently accurate for ordinary use. The value of M is 3,000 for single leather and four-ply rubber or cotton belts, and 2,000 for double leather and six-ply rubber or cotton belts.

$$T = \frac{33{,}000 \times HP}{V}$$

$$T = W \times S \quad S = \frac{T}{W} \quad W = \frac{T}{S}$$

$$HP = \frac{D \times R \times W}{M} = N$$

$$W = \frac{HP \times M}{R \times D} = B$$

$$D = \frac{HP \times M}{R \times W} \qquad R = \frac{HP \times M}{D \times W}$$

The horse-power transmitted by a

5-ply	cotton	or	rubber	belt	=	$N \times 1.33$
6	"	"	"	"	"	"	1.66
7	"	"	"	"	"	"	2.00
8	"	"	"	"	"	"	2.33

The width of belt required with

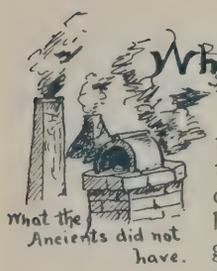
5-ply	cotton	or	rubber	belt	=	$B \times .75$
6	"	"	"	"	"	"	.60
7	"	"	"	"	"	"	.50
8	"	"	"	"	"	"	.43

The driving pulley should always receive the belt at the bottom. Never run chain belting at a greater angle than 60 degrees, and not to exceed 1,000 feet per minute for the smaller sizes and at less speed as the sizes increase. Chain belt may be run on horizontal pullevs, provided there is a tension pulley to take up the slack. Chain belting may be crossed, but the wheel centres should be as great as possible.

Don't pin too much faith on evaporation tests until you know the kind of coal that was used.

In the Time Before Chimneys.

BY E. C. WEAVER.



When snow and ice abound in the streets of our northern cities, and the cutting wind of winter meets us at every corner, we look out from behind double panes of glass and toast our feet upon the hot water radiator with considerable comfort. Perhaps a few of us become meditative, and permit our thoughts to wander from the crowded thoroughfare below, into the mysterious regions of the far past, and wonder what mortals did in those days when winter came. Indeed, the thought may wander so far back as to step off into an age when fire and consequently artificial heat was unknown.

It is presumed that ever since the advent of the human race the sun has been with us, and from its genial rays man has known the sensation of heat. But certainly there was a day when

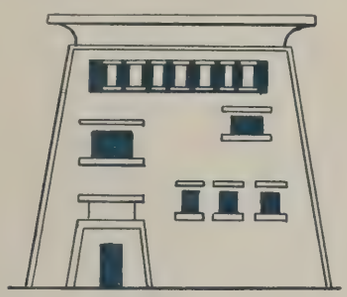


FIG. 1.

man knew not the thing "fire." Indeed, no later than in 1521 the restless Magellan found upon the Marian Islands a people who knew not fire. When the voyagers set fire to the hut the natives were astounded. They deemed that it was some sort of an animal that was devouring the structure, and many were afraid. Some bolder spirits went to the fire and touched it. They fled, believing the animal to have bitten them.

Almost every ancient people have their legend of the discovery of fire. The Phœnicians believed it to have been discovered by a hunter in the fastnesses of the forest, where the high winds of the storm rasped the limbs of trees together until a flame burst forth. Prometheus, who robbed the gods of the sacred flame, and carried the precious spark within the joint of a reed, is too familiar a figure in poetry to need more than mention. It is, however, interesting to know that to-day in parts of the Grecian Archipelago, fire is carried from point to



FIG. 2.

point within the dry slow burning pith of a certain reed.

The knowledge of fire having been distributed pretty well over the world among living people, it is noticed that for thousands of years an open fire alone was used for the purpose of warming and heating during periods of exceptional cold.

In old Egypt is to be found the early prototype of the modern row-house, for there the houses were connected, and formed the sides of the streets. They were seldom more than two stories high, and the halls for reception and sleeping were both upon the second floor. Stucco was freely used, and the inner walls of the rooms were painted. Doors were either single or double, and turned upon pivots. The windows were similar to the doors, and were made quite small. In winter these houses were decidedly cold, for the region suffers a depression of the thermometer as well as other lands. The only fire or heating apparatus comprised braziers of metal, or open hearths, in which straw and stubble were burned, for wood was too scarce and valuable for such a purpose. The open hearths were without chimneys, and the smoke found egress as best it could. The rankness of the smoke was overcome in a small measure by the use of sweet smelling gums and incense, but at best it was fraught with great discomfort. As a rule these fire-places were in one room—a chamber of minor torture. While glass was well known to the Egyptian artisans, and they were skilled in its working, yet window panes were never known.

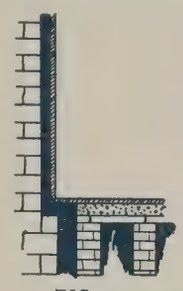


FIG. 3.

Of the accompanying engravings, Fig. 1 shows an Egyptian roof garden,

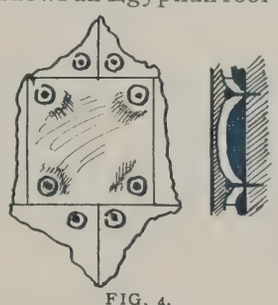


FIG. 4.

Fig. 2 an Egyptian house with a *mulquf*, Fig. 3 a caldarium showing hypocaust, Fig. 4 the flue tile for caldarium walls, Fig 5 a Roman bath heater, Fig. 6 the flue tile used in the Roman bath, and Fig. 7 the hypocaust at Lincoln.

In the summer season the house of the Egyptian was a place of joy, for then the hot and dusty *merisj* blows over the face of the land, and it is a saying that "the *merisj* enters even the shell of an egg." The tops of the houses were planned into veritable roof gardens, the second roof being supported by a system of pillars, as shown in Fig. 1. Here the people of the Nile found comfortable rest at night, ample netting being used to ward off the attacks of gnats and mosquitos—for New Jersey had sent its contingent even at that early day. In many houses the *mulquf*, Fig. 2, a wind shield or funnel directing the breeze down to the floor below, was used. This probably was the earliest embodiment of the favorite down draft

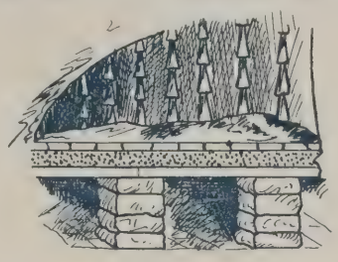


FIG. 5

system of ventilation, and it is curious to note that the mulquf is popular in the lands of the Pharaohs to-day. One deviation, however, is noticeable. The mulquf of the early Egyptians was so constructed as to open to several quarters of the horizon, while the moderns are satisfied to have theirs directed to the northwest, the quarter from which the general night winds blow. Openings in the walls of rooms were made near the ceilings, and opposite to each other, so as to obtain ventilation, showing that the ancients were up in the science.

In its early stages the art of making fire was certainly imperfect. Artificial draft became a necessity, and the first bellows was in all probability nothing more nor less than a pair of human lungs, the air being directed through a tube. Strabo assigns the invention of bellows to Anacarsis, a Scythian philosopher, but paintings of the Egyptians show their using such a device long before that celebrity's time. A drawing of the time of Thothmes, who was the Pharaoh of Moses, shows a bellows comprising a pair of bags under the feet of the operator, and both opening out into a single tube. The bags were distended after the foot was taken up, by means of cords worked by hand. And, moreover, one of these bags is shown as distended and without support, hinting to the presence of a valve.

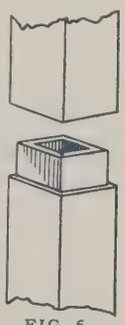


FIG. 6.

In Hebrew Canaan a similar state of affairs was in all likelihood extant. In 2 Kings, ix, 30, it is noted that King Jehoiakim, while living in his winter house, receives a message or roll from Baruch which he casts into

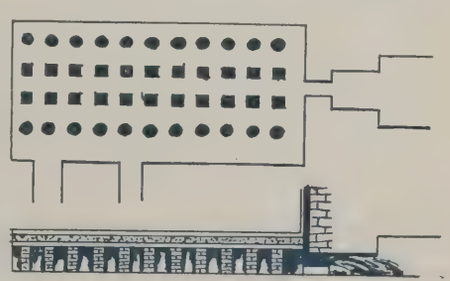


FIG. 7.

the open fire before him, the reason not being quite plain. It remains that the fire was upon a ha-ach or hearth, that

being the heating device for the winter house. The smoke made its exit through a hole in the roof, or the arubbah. The rabbis of Jerusalem boasted that their city was so pure that not a chimney could be found, but it is suspected that the dearth of those commodious tubes was due more to ignorance than purity, for Barach comments that "the faces were blackened by the smoke that cometh from the temples."

The Greeks were remarkably lacking in devices for their comfort in winter. Their ingenuity seems to have failed at this point. The boast of the Spartans was their regardlessness of the inclemencies of the cold season. Indeed, the open fires that abounded among these people were not venerated, even for the purposes of cookery, if we may believe some of the scenes depicted by Homer.

Among the Romans, advances in the art of heating are to be found. Pompey, in making a visit to the villa of his friend Lucullus, is charmed with the conveniences and beauties of that home, but is the true friend in suggesting that the winter season must be intolerable in such a place. To which Mr. Lucullus replies with spirit: "Think you that I have less forecast than the cranes and storks, and that I know not, as they do, how to change my habitation with the season?" It is to be remembered that Mr. Lucullus lived prior to Mr. Franklin and his celebrated Poor Richard's maxim, otherwise the noble Roman would have sought to improve upon migratory birds. In the Roman winter-houses heat was secured by means of braziers filled with burning charcoal and incense and aromatic woods. Vitruvius, the great Roman architect, directs his workman, in constructing the room containing the fire- hearth, to place black panelling with red and yellow borders above the podium, and to use very little ornamentation in the room, because the smoke causes general ruin.

The same authority, Vitruvius, gives a description of a caldarium, or room for sweating clients before the bath, shown by Fig. 3—for Romans called all customers clients, as well as their poor relations, probably for the same reason that the term is used among lawyers to-day. The caldarium has a double floor, the nether one sloping to the center, where a furnace is placed, and being paved with tiles about eighteen inches square. A series of pillars composed of brick rise about two feet from this floor, and support the floor proper. This latter is composed of tiles and an intermediate layer of cement, in all about ten inches thick. The furnace part of this apparatus is called a hypocaust and is the progenitor of the Dutch oven and the Furman heater. In the caldarium air is admitted through an opening in the roof, which is regulated by a shield. This is a very wise precaution to prevent the client from being baked. In all of these apparatus, what Anderson calls "an elegant and commodious tube, now known as a chimney," seems to be nil.

Seneca gives a hint of an interesting apparatus in the following: "Many inventions have been divulged within my memory, such as windows formed of a transparent plate, also suspended baths, and a pipe from hypocausts so inserted in walls as to spread an equal warmth through the room, and heat what are beneath as well as what are above." Is not this an anticipation at least of the down-draft hot air system of heating?

Winkleman, the famous explorer of and writer on Pompeii and Herculaneum, describes apartments with tile passages beneath them, which were cemented. Such passages had openings into the rooms by means of ornamental apertures, and led to a subterranean chamber known as the sudatorium. The latter was heated by means of a furnace. It occurs that it makes considerable difference whether the fires of the furnace were continuous or intermittent, for, if the latter was the case, a very respectable hot air system could be made of the apparatus.

A caldarium like the one described is shown in Fig. 3, also a method of heating the walls by the use of a sort of pan-shaped tile, Fig. 4. The tiles were nailed to the wall, and a coat of stucco applied on the outside to make a finish. There was no circulation of the hot air from the hypocaust, however, and, therefore, much of the benefit was lost.

One of the great baths of Rome presents features that are decidedly interesting. Beneath a water-heating chamber, which has a compound tile and cement floor, is a hypocaust such as has already been described, but a series of flues composed either of cone-shaped tiles or rectangular tiles with connecting lips run from the hypocaust through the water chambers. The Roman bath heater and the flue tile used in the construction of the bath are shown in Figs. 5 and 6 respectively. In the temple of Isis in Pompeii there is said to be the remains of a chimney. These are the only known remains of antiquity that suggest an artificial draft.

The younger Pliny, in his celebrated villa at Laurentinum, depended in a great measure for warmth in winter upon the architectural planning of the rooms to secure long exposure to the sun's rays. A few of the rooms, more particularly those occupied by Mr. Pliny, Jr., however, were heated by means of hypocausts, and from their meager provision we are led to suspect that a coal trust was in full operation. The rooms were well ventilated, the leeward windows being opened without chilling the apartments—a method, by the way, that Hippocrates used in plague-stricken cities, much to his renown.

When the Romans came to Britain they found the climate inhospitable enough, and it is noticeable that the hypocausts became at once large and numerous. The one at Lincoln, sketched in Fig. 7, shows what the new region demanded. It is twenty-four feet long and nine wide; the floor is ten inches thick, and composed of stucco, cement, and tiles. Another remarkable example of a similar construction is the villa at Woodchester, which was built for the Emperor Adrian, but never occupied. It is probably the best preserved structure in England, and shows the plans clearly. It contained sixty-five rooms, nineteen being of good size. All of the rooms and passages of the main building were provided with hypocausts. The principal hall was paved with a magnificent mosaic, and the heating apparatus for it was for no other purpose than to keep it dry.

It remains to say that the hypocaust, while failing to create great heat, embodies a very advanced idea in heating systems, which our time has taken up and perfected. We are reminded of the proverb, "There is nothing new under the sun," and, perhaps, there is a greater shade of truth in it than sometimes appears.

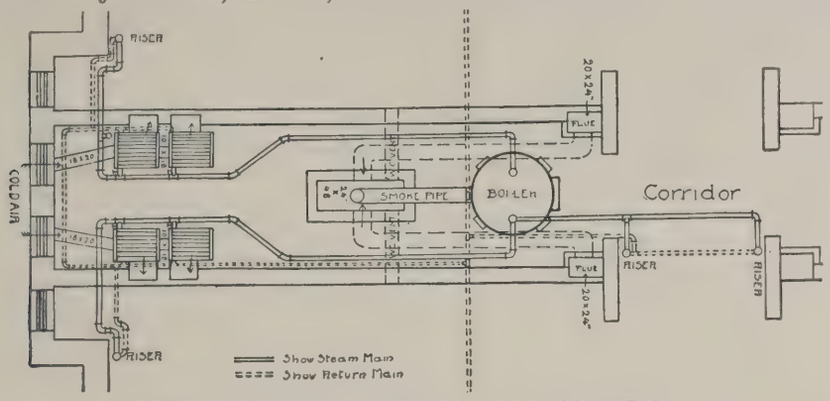
Rusting of Iron.

Prof. V. B. Lewis of the Royal Naval College, Greenwich, at a recent meeting of the institue of Naval Architects in London, presented some intresting remarks as to the rusting of iron, which, he explained, is a definite chemical action due to the conjoint action of air, moisture, and carbon dioxide upon the metal. The increased rate of action may be due, he said, either to increase in chemical action brought about by local increase in temperature, or it may be due to galvanic action set up between portions of the same metal at different temperatures. The fact that the double bottom plates of ships near the boiler corrode more rapidly than similar plates in other parts of the vessel is undoubted, and the increase in temperature near the boiler is the only factor. It is also noteworthy that the plates at the bottom of the cellular spaces which are kept cool by contact with the sea water do not corrode; and cases are not wanting in which part of the plate which get locally warmer than other parts—although the difference can only be a few degrees—corrode much more rapidly than the cooler portions. Experiments show that the rapid corrosion found in the double bottoms near the boilers or other sources of heat is due to galvanic action, and not to rise of temperatue simply increasing chemical activity; but it must not be forgotten that when ashes are drawn and quenched with water—especially if sea water be used—gases having a corrosive action on metals are very apt to be liberated.

To clean brass or copper, mix together 1 ounce oxalic acid, 6 ounces rottenstone, and ½ ounce gum arabic, pounded finely; add 1 ounce sweet oil, and sufficient water to form a paste; apply, and rub dry with flannel or wash leather.

Heating System in Johnstown School.

The accompanying illustration, Fig. 2, shows one of four No. 6 Gorton house heating steam boilers, made by the Gorton & Lidgerwood Co., 96 Liberty street, New York, used for heating two school buildings recently erected at Johnstown, N. Y., each building being 66 by 84 feet and two stories high. Wesley Lynes, of that city, who installed the heating and ventilating apparatus in these buildings, has been highly complimented upon the simplicity and effectiveness of the plant, which was thoroughly tested during the past winter, and is considered a model one in every particular.



HEATING SYSTEM IN JOHNSTOWN SCHOOL.—FIG. 1.

Two boilers are used to heat each of the buildings, the arrangement in one being duplicated in the other, the heating being done by a combination of the direct and indirect systems.

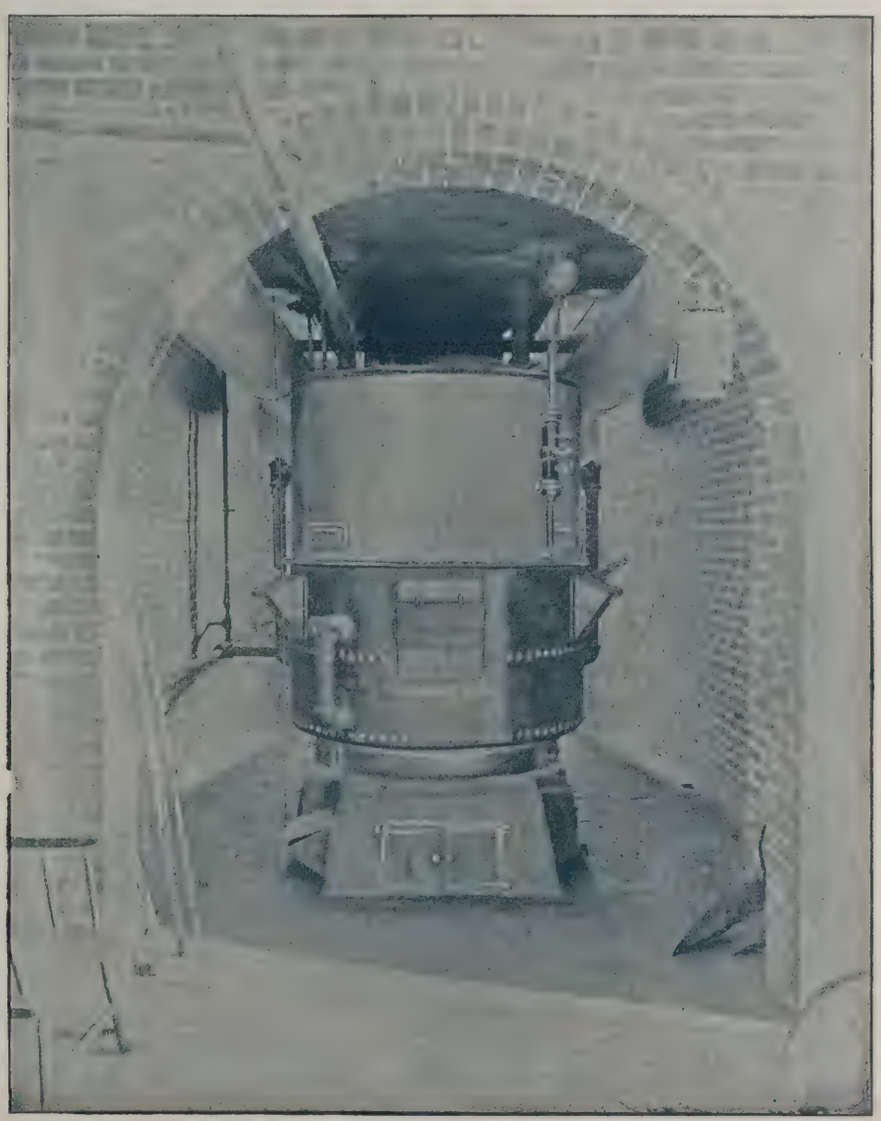
The school rooms are each 26 by 34 feet, and are warmed by wall coils extending along the exposed wall, each presenting 100 square feet of radiating surface and made of one-inch pipe.

In the basement are four stacks of indirect radiators, each containing 165 square feet, and inclosed in a box lined with galvanized sheet iron and supplied with air from out of doors through a galvanized sheet iron duct 18 by 20 inches.

These indirect radiators connect with a tin-lined flue 8 by 20 inches in size, and lead to 16 by 20 inch registers in each room. By this means there is a constant inflow of fresh, warm air, supplying a wholesome atmosphere for the pupils. The air in the room is drawn out to make room for the fresh air by means of ventilating flues 20 by 24 inches, and having 20 by 24-inch registers in them, at the inner corners of the rooms, and connected by a 16-inch round pipe with the 24 by 48-inch ventilating shaft that runs up through the coat rooms. The ventilating registers in the lower rooms are connected with the ventilating shafts by the round pipes running down into the cellar and along under the floor, while those on the upper floor run up to the attic, and there extend over to the shaft. The partial plan view in Fig. 1 shows the position of the boiler and of the indirect radiators.

The ventilating shaft is heated by the smoke from the boiler entering a 12-inch smoke stack made of No. 12 iron that extends to the roof. A constant draft is maintained at each of the ventilating registers, and the air in the school rooms is being constantly changed and freshened without the temperature being affected or disagreeable air currents produced.

In combining the direct and indirect systems a uniform temperature with a good system of ventilation has been obtained, and the manufacturers state that by using both systems the cost of the apparatus is but little more than by the direct system and much less than by the indirect system, both in the erection and operation, from which it would appear desirable for building committees to consider the system here described when laying out or deciding upon a suitable heating apparatus for school buildings.



HEATING SYSTEM IN JOHNSTOWN SCHOOL.—FIG. 2.

When your coal bills are too high look carefully for the cause. It may be the fireman, and probably is if he is a cheap man; or it may be the fuel, and probably is if that is too cheap; or it may be that your furnace needs a slight adjustment to bring it into the best working order for the fuel you are using. Eternal vigilance is the price of economy, and the man who obtains the greatest amount of work with the least amount of coal, must know the laws of burning bodies, and, above all, know every little trick of his own particular fuel and be up in a multitude of wrinkles to help the thing along.

Whenever warm air, with a moderate amount of moisture in it, says an exchange, comes in contact with a very cold surface it becomes cold itself, and the moisture in it is deposited upon the cold surface. When a hot water heating pipe is left in the summer time filled with water, or when an ordinary service pipe runs through a warm room, we often find them in May and June dripping with water. Their cold surfaces cool the air next the pipe, and, of course, the air, being capable of carrying a less quantity of water than before, leaves some of it on the pipe, and in this way the annoying sweating takes place.

What is Steam?

The above question is frequently asked of engineers nowadays, says Machinery, and although they make constant use of steam, very few will answer that "steam is an invisible gaseous fluid, generated by the aid of heat from water." Many of them when told that steam is invisible, laugh and say they know better, becuse they see it every day. If one of these men who claim the honor and name of practical engineers will take a look at the water glass in the boiler room, if they have one—if not, let them look at the one on their neighbor's boiler—and then tell if they can see any steam inside of it. If the glass should happen to burst while they are making the observation they will, no doubt, see plenty of what they call steam in the vicinity, and they might also see the same if the safety valve should happen to blow off. Why, then?

Simply because steam is invisible, and so long as it is confined you cannot see it, but when it is cooled off, as when it comes in contact with the air, and is consequently condensed again to the water from which it originated, it becomes visible to the eye, like water in very small particles, as in fog.

Viewed at such times it has lost its characteristics as steam, and instead of being a gaseous fluid it has become condensed to water in very small particles, which occupy considerable space. When in this condition we see what we call steam, but when an engineer notes the flow of steam, from gauge cock or safety valve, he will notice that near the opening nothing is visible, while at some distance he sees a fog.

The reason of this phenomenon is that at all times steam is invisible while it remains steam, but by condensation and the formation of water a fog is produced, which can be seen, and distinguished in no way from fog which rises from rivers, swamps, or other bodies of water during such times as the temperature and other conditions are favorable to its formation.

Burnt boiler plates are due to "low water," to a deposit of sediment, to continued impact of flame caused by leaks of air through the masonry, and when a seam is just back of a bridge wall; but sometimes it is caused from an incrustion, or soap formed from oily matter.

Practical Ventilation Work.—IV.

BY VENT.

In the three previous articles three systems of ventilation were shown, whereby the impure air was exhausted (1) by means of placing steam coils in the exhaust chamber in the attic, (2) by high brick ventilators, and (3) by fans run by electricity. The system shown herewith is to exhaust the impure air by means of naturally fresh air drafts. Fig. 1 represents the longitudinal section of a building showing the flues, receiving pipes, ventilators, and ventilating dormer windows. *A* and *A* in Fig. 1 represent the two ventilating louvre dormer windows, one at each end of the hipped roof, *B* and *B* the two ventilators placed over the ridge of the roof in-

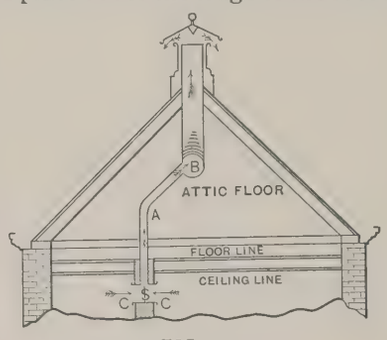


FIG. 2.

side of which the receiving pipe goes up as high as is indicated by *C* and *C*.

Galvanized sheet iron pipes are built into the brick flues as the mason work goes up, and run up to the floor line of the attic, and then by means of sheet iron pipes, which are indicated by *E* and *E* in Fig. 1, they are connected to the receiving pipe as shown.

In a building having this system of ventilation, the rooms are heated by hot air coming from the furnace in the cellar, through bright charcoal IX tin flues, through registers near the floor.

The warm air passing upward and carrying with it the impure air, which is exhausted through the registers near the ceiling as shown in Fig. 2, and by having the ventilation arranged as shown in Fig. 1, a natural draft is created which exhausts the impure air through the ventilator into the atmosphere. As the attic stories are often required for store rooms and other purposes, a ventilator, indicated by *H* in Fig. 1, is placed over the ridge of the roof, which ventilates the attic only.

In Fig. 2 is shown a transverse section of a building, showing the method of ventilating two rooms into one flue, with the use of but one register box.

Referring to Fig. 2, *C* and *C* represent the register openings in the single register box, in the center of which a sheet metal partition is placed, as indicated by *S;* this prevents the impure air of one room entering into the other, as the partition is so placed as to extend two or three inches into the flue pipes; the air entering from each side passes directly into the flue *A* and up into the receiving pipe *B*, and out into the atmosphere through the ventilator. Fig. 3 shows an enlarged perspective view of a register box having two register openings, *D* and *D*, while *C* shows the partition which extends into the flue pipe, shown by *A* and *B*. A few words in reference to the construction of the ventilating dormers may not in this connection be out of place; the flanges or laps should be so made as to obtain ready connection to the ventilation pipe.

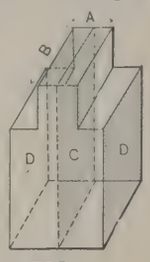
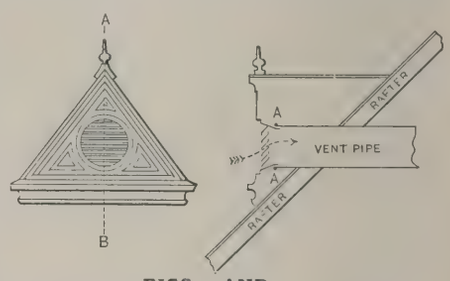


FIG. 3.

Fig. 4 shows a front elevation of a ventilating louvre dormer. Fig. 5 shows a section taken through *A B* in Fig. 4, and shows the method of constructing the flanges. As will be seen, the opening which receives the louvres is funnel-shaped and has a flange attached on the inside, as is indicated by *A A*, over which the ventilation pipe is slipped when making connections. The louvres are placed quite close together, with an angle



FIGS. 4 AND 5.

or edge bent upwards at the back, and downward at the bottom or front, which prevents the snow from blowing in.

(The end).

In concluding a paper on incrustation in steam boilers, Mr. J. C. Simpson said that if the following three rules were attended to, less trouble would be experienced with incrustation. (1) The blow-off tap should be opened the first thing in the morning, and again at starting after stoppage at each meal, and kept open for 20 seconds at a time; (2) a suitable fluid should be put in regularly with the feed water; (3) when the time came round for boiler-cleaning, the water should be kept in after the steam is blown out, the dampers opened, and the brick-work allowed to cool for thirty-six hours, if practicable, after which the water should be run out, and the cleaners sent in as soon as possible.

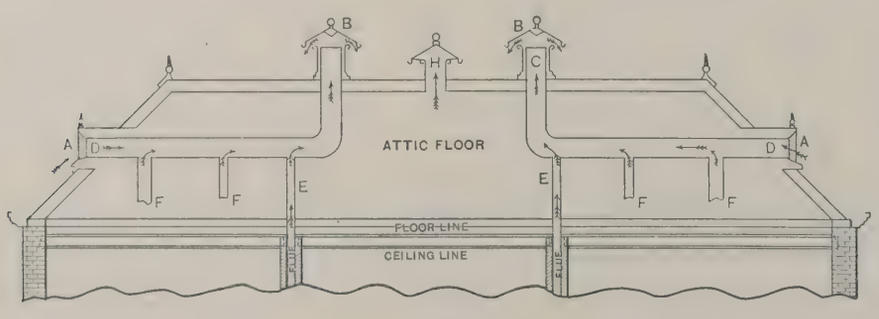


FIG. 1.

Heating and Ventilation of the North Street School, Wilkesbarre, Pa.

Though not a large building, it seems to be the opinion of all those who have inspected it that the North Street School, of Wilkesbarre, Pa., is one of the most complete in the State, reflecting great credit not only on the school board, but upon the architect and builder as well. The building is remarkably well lighted, the rooms being large and airy.

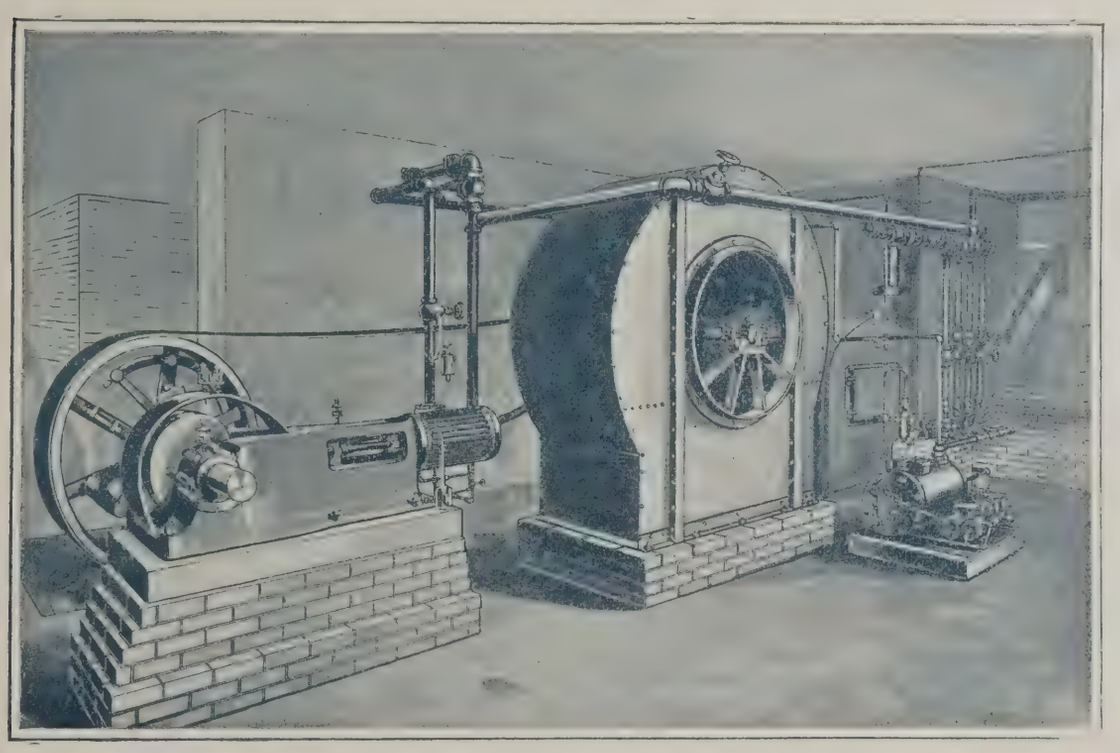
With the idea of having the best possible system of heating and ventilation the school board adopted the blower or hot air blast system as designed by Messrs. Carpenter & Co., heating and ventilating engineers, of Wilkesbarre. This system comprises a boiler, engine, fan, heater, pump, and system of air distributing ducts, together with necessary means for conveying the steam to the apparatus, and for returning the water of condensation therefrom.

The forty-horse power, full flush front, horizontal return tubular boiler, 48 inches by 12 feet, contains 52 three-inch tubes, and is fed by water pressure direct from the city main, and by a Worthington pump. The boiler pressure may be maintained at any desired point by the use of an automatic damper regulator controlled by the steam pressure. The boiler is connected with the smoke stack by a 20-inch flue of No. 12 wrought iron, and with the sewer for blow-off. The boiler grates are built for the purpose of using buckwheat coal, thereby reducing expense of running to a minimum.

An 8 by 10 automatic, center crank, self-contained, horizontal engine, manufactured by the Buffalo (N. Y.) Forge Co., is connected with the fan, as shown in the accompanying cut, by a 9-inch leather belt, and is mounted on a brick and stone foundation with a 4-inch capstone. The engine is fully equipped with sight feed oil cups and a Swift sight feed lubricator for the steam chest. The governor, which is in the fly-wheel, is very sensitive and insures close regulation and quiet running. The cylinder is of sufficient capacity to admit of very low pressure, the exhaust from the engine being utilized by passing it through a back pressure valve into the heater.

Besides being able to heat the building in cold weather, the system is so arranged that in warm weather the janitor, by means of a simple device, controls a method of supplying each room with cold fresh air as well. The fan used is guaranteed to be built of the best material and workmanship, to run with less power, to be more durable, to be so proportioned as to give greater suction and expulsive force, than those of any other manufacturer. The fan is ninety inches high, with an average speed of 376 revolutions per minute, and a capacity of 39,000 cubic feet of air at one ounce pressure. The cold fresh air is brought from outside through galvanized iron ducts to the fan, which forces it into and through the heater, thence into the warm air flues to the several rooms. The heater consists of five coils of pipe containing about 3,000 feet of heating surface, and is connected to the boiler by a Belfield pressure regulating valve with which the pressure of the steam in the coils may be varied at will from one to five pounds. Each coil is controlled by feed and return Jenkins valves (Jenkins Bros.) so that one or more coils may be used. The water of condensation from coils, both from direct steam and exhaust, is returned to the boiler by means of a 3 by 2 by 3 Worthington automatic pump and receiver. The entire heater is encased in a steel plate jacket connecting with the fan. The distributing ducts and flues are constructed in the inner brick walls, the apparatus being placed in the basement, and connection made to the base of the flues, while the air is delivered to the rooms through wall registers above head level.

Escape for foul air is provided through vent flues with registers at the floor level, and nearly beneath the heating registers. The apparatus is guaranteed to warm all rooms occupied as school rooms to 70 degrees in the coldest weather, and allowing 30 cubic feet of fresh warm or tempered air to each scholar per minute. Messrs. Carpenter & Co. have also installed two sets of Dr. Ross' cremating closets and one slate urinal, all of which are ventilated by means of two stack heaters, which are entirely independent from and in no way connected with the warming and ventilating system, therefore cannot under any circumstances affect the air in any part of the building by means of down drafts. The closets are constructed entirely of japanned cast iron, brick, and stone and are, therefore, fire-proof. They and the urinal are guaranteed to be absolutely odorless and perfect in operation.



HEATING AND VENTILATION OF THE NORTH STREET SCHOOL, WILKESBARRE, PA.

The temperature of the various rooms is automatically regulated by electricity. A thermostat in every room is fixed at 70 degrees. A change of one degree either way is sufficient to cause an automatic regulation of the air currents. If the temperature falls below 70 degrees a valve is immediately opened to let in sufficient warm air to bring the temperature up to the required standard. Then the valve closes automatically. The temperature is reduced in the same manner, cold air being supplied whenever the thermostat indicates a rise above normal conditions. The mechanism by which these results are brought about is known as the Johnson system of heat regulation, manufactured by the Johnson Electric Service Co., of Chicago.

The school is a model one in every respect, and should be a source of pride to the people of Wilkesbarre.

It is estimated that 80 per cent of the boiler building material used for steam vessels in the United States is manufactured in and around Pittsburg.

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS.

Suggestions for its Advancement.

[Believing that suggestions as to the best means of insuring the success of the American Society of Heatin and Ventilating Engineers would be of interest, we have written to its members for an expression of their views on the subject. The benefits to be derived from membership in the new society will be greatly enhanced by the individual interest taken in its progress, and it gives us pleasure to publish some ideas which it is thought will best secure its advancement.—Eds.]

From John A. Payne, Capitol Heating Co., Providence, R. I.:

In reply to your question "How can the American Society of Heating and Ventilating Engineers best benefit its members?" I would offer the following few suggestions: By being careful, in its selection of members; by using every means within its power to increase their practical and scientific knowledge of their profession; by raising the standard of heating and ventilation; by using its best endeavors to eliminate mean professional jealousies; by fostering their social and professional intercourse; by keeping in touch with its most distant members through the medium of some first-class publication; by keeping their interest alive; by constantly affording new food for thought; and, in short, by so managing and directing its affairs and looking out for the advancement of its members in every way that when any person or corporation desires the services of an expert they will feel that the fact of a man being a member of the A. S H. V. E. will be a sufficient guarantee of thoroughness and reliability.

From A. C. Edgar, Model Heating Co., Philadelphia, Pa.:

The American Society of Heating and Ventilating Engineers can best benefit its members by establishing a clearly defined minimum standard of heating and ventilation for all classes of buildings

From H. J. Barron, Barron Steam Heating Co., New York:

I think the new American Society of Heating and Ventilating Engineers will exercise an excellent influence in our field of effort in various ways. One will be making their plans and specifications so plain and comprehensive that the contractor can figure to a dollar what the work should cost. The second will be to insist that every building that comes under their influence shall be properly ventilated as well as heated; if the engineer is overruled and scouted at, he will still insist and again insist, and in a little while he will have his way. The third will be the interchange of knowledge, or rather experience, between engineers of different classes. The consulting engineer will come in contact with the manufacturing engineer, and the latter with the contracting engineer, and all will receive pleasure from an interchange of views. The eighth paragraph of Sec. 4, Art. 1, of the Constitution defines the advantages of the society to the public and to its members, but there are many benefits that can not be strictly defined. I remember a great many years ago a so-called consulting engineer would go to the steam heating contractor and get him to make his plans and specifications. The consulting engineer would be paid by his client and also by the contractor who got the work. It is needless to say that the fact of being a society of real heating and ventilating engineers will put a stop to anything of that kind. There are a great many shams, some of them harmless, others real evils, that a society of this character puts a quietus on at once by the very fact of its being in existence. Its mission is to secure to society, to the whole world, perfect heating and ventilation. While it cannot reach this high aim, it can approach it; and while it cannot change human nature, its tendency will be to establish a high ethical standard among its members, so that the fact of work being in charge of one of its members will be a guarantee of excellence and of everything that means honest workmanship. It will be the repository for all learning, for all knowledge, in its own especial field, and the bright men throughout the world who are interested in heating and ventilation should be members. The arrangement of juniors, associates, and members gives every one who is interested in its objects an opportunitmy to participate in its benefits.

From Chas. S. Onderdonk Heating and Ventilating Co., Philadelphia, Pa.:

I have received your respected favor of recent date in which you ask my views as to how the American Society of Heating and Ventilating Engineers can best benefit its members. Without giving the matter the mature thought that such an inquiry demands I would briefly state the salient points that occur to me at this writing. The benefits to be derived are so multitudinous that it would be impossible to treat of but a few of them, but the more important points can only be briefly mentioned.

It is at once apparent that the greatest benefit to be desired will be the communion of thought and the inter-communication of ideas brought about by discussion and contact. It will be entirely necessary, however, that all business benefits should be exempt from these meetings, and that the idea of each member should be to impart to his fellow-members any information relating to heating and ventilating subjects which he thinks his fellow-member is not possessed of. It does not matter how great a man's ability is, he can always be taught something by a lesser light, and this constant interchange of thought will tend toward the triumph of the art of heating and ventilation.

It would appear to me, without making any suggestion as to the routine of management of the affairs of the association, that there should be certain times appointed, either quarterly, semi-annually, or annually, for a convention to be held at some point most convenient to the majority of the members, and at this convention papers should be read on matters germane to heating and ventilating, which would lead to discussion and the final sifting out of important facts.

I also think that there should be appointed a correspondent to whom all the members can apply for information on subjects on which they need light; and this correspondent, being familiar with all the members, can apply for this information to such other member as he knows can give it, and he in turn can transmit it to the inquirer.

I also think it highly essential that some journal, say your own valued paper, should be selected by the society as their medium, in which the members can publish from time to time their ideas, or make inquiries, and can announce to the fraternity at large any peculiar result or effect that they have come across during their professional calling.

It is also to be sincerely hoped that none of the members of the society, who may engage at the same time as contractors, will withhold from the fraternity at large any desirable information which they may possess, and which may be of advantage to the society.

If the society is carried on in this liberal, open-handed manner, it cannot but result in advantage to us, as heating and ventilating engineers, and to the community at large. As before stated, these are merely ideas that occur to me hastily without giving the matter mature consideration.

From John Gormly, expert, 1,433 Columbia avenue, Philadelphia:

I think our first effort should be to establish a standard of values for services, upon which each member should be requested to try and collect. It would be an interesting study to determine what attraction leads the most generous young men of our land into the steam-heating business, or why non-generous men are, by entering our profession, so quicky transformed into models of self-sacrificing generosity. It would appear certain that they are in the business, for does not the public consider it an insult to offer a remuneration for services in our profession? Yet corresponding services by an architect or civil engineer would only be sought for recompense. How many individuals ask one to lay out a steam job, make a set of specifications, and an estimate of cost, yet expect as a matter of course you don't want pay for it? How often has each member of our society been asked to bid on work, making his own specifications, where he was morally certain from six to twenty others were doing likewise, with a knowledge that but one could win and the rest had their labor of love for nothing? Is that right? Would the owner have had more than three bids if he were compelled to pay for value received? Have you never spent days perfecting the details of a bid and specifications and found afterward that the owner was "playing you" and all along intended to give the operation to another? We should arrange matters so that those who want our ideas incorporated in an operation should pay for them. Is it not time for us to place our business on a business foundation, and establish debits and credits as we should? Why should we assist boiler manufacturers who advertise to send a heating engineer, lay out the job, pay their own traveling and hotel bills while doing so, and do all for nothing providing their boiler be used? Such actions run our profession into the ground, and we should antagonize them. The boiler men will be our aids in the matter. They would drop that item of expense gladly were they certain their neighbor would do it also. They are not thanked even now for that outlay. We must set a value upon our services commensurate with the skill required and the labor performed. Comparatively speaking, our profession is in its youth. We require as much training, skill, and intelligence as the physician or lawyer, yet services for which they would receive fifty dollars we charge nothing for. Before being generous let us be just to ourselves. If we set no just value upon our services how can we expect others to value them?

Another point of advantage to our society would be to have a neat card, with the name and address of our society and each member's name and address, sent to the offices of the architects of the United States, and sent yearly, as the membership changes by death, withdrawal, or election. For our own office we should have a neat certificate of membership, framed and hung conspicuously, to let the world know "we are in it" for business and pleasure, and are proud of it.

From B. Harrold Carpenter, B. G. Carpenter & Co., Wilkesbarre, Pa.:

In reply to your question how can the American Society of Heating and Ventilating Engineers best benefit its members? I would say, generally speaking, by bringing the subject of heating and ventilation before the public at large so directly as to

create a demand, not for cheaper but for better heating and ventilation; and also by bringing to so bear upon the members the necessity of a higher grade of work as to cause them to strive to outdo one another, not as now, in a question of price, but as to the best results.

I would favor legislation compelling a certain amount of ventilation in all public buildings, the amount to be fixed according to the character and purpose of the building. Also, would not a public inspector, to whom all plans should be submitted, be a benefit?

The idea is prevalent with many that competition is the final religion of the nineteenth century and that any restriction on competition is a crime. The nineteenth century is rapidly drawing to a close, and with the advent of the twentieth century would it not be a glorious attainment if the American Society of Heating and Ventilating Engineers could change the demand for cheap heating and ventilating systems to a demand for the best systems?

From Thomas Barwick, Arlington, N. J.:

Your inquiry "How can the American Society of Heating and Ventilating Engineers best benefit its members" suggests the answer, By benefiting the public in general.

First—By adopting a standard of temperature for heating various types of buildings that shall be acceptable to heating engineers and the architects and the public.

Second—By the adoption and demand of better ventilation among the tenements of our large cities, so that the general health of the public shall be benefited, insuring prevention as far as possible, of contagious diseases.

Third—By the adoption of a standard of ventilation for various types of buildings, and the agitation of this question among all classes of men, to the end that it will be demanded in future construction of buildings.

Fourth—The enforcement of wise laws in regard to the ventilation of public crowded buildings, theaters, assembly halls, etc.

Fifth—The co-operation of all heating and ventilating engineers in carrying out the above suggestions.

Sixth—Increasing the membership of the society, by the addition of members of the profession who make studies of its various branches, and the forming of branches in the various large cities to have informal meetings, at which discussion shall be free upon all topics relating to the public welfare in connection with heating and ventilating. We must make ourselves interesting to the public, and the public will become interested in us, and the members of the American Society of Heating and Ventilating Engineers will become one of the forces of the times, benefiting themselves by benefiting others. Assisting in improving the health of the community, they will reap the harvest of wealth from the general country.

From J. D. Hibbard, The John Davis Co., Chicago, Ill.:

I would say I do not know that my views in regard to the possible work of the American Society of Heating and Ventilating Engineers, given in an off-hand manner, would be of any particular value to anyone. At the same time, I would say that I am very glad that such an association has been formed, and hope that it can be made of a great deal of value, both to its members and to the profession at large, and I shall be glad at any time to do what little I can to this end.

From F., S. Kidder, 249 Water street, New York:

In reply to your inquiry as to how the American Society of Heating and Ventilating Engineers can best benefit its members, I will say that in my opinion, Mr. Smith, in his address to the Society on September 10, quite thoroughly covered the ground. If those principles are carried out, they must result in much good, not only to the members of the society, but to the public, or that portion of it which may become patrons of its members. A more uniform opinion on different points is what is necessary for the highest class of work. The reading of papers, and subsequent discussion on points thus brought out, will, no doubt, do much to accomplish this end. I also believe that data should be compiled from as nearly actual and fair tests as possible. This would then allow work to be done on an actually tested plan, thus doing away with much experimental work, which is no doubt done at the present time, with the existing diversity of opinion among heating engineers.

From J. H. Kinealy, Washington University, St. Louis, Mo.:

In re ly to your inquiry I will say that it seems to me that the interests of the members of the American Society of Heating and Ventilating Engineers will be best promoted by encouraging the writing and free discussion, orally or in writing, of papers on subjects pertaining to heating and ventilation, and the publication and preservation of the papers in the transactions of the society. Members engaged in contracting or commercial practice have seldom the desire or time to write long treatises on any subject, but are usually glad to give to the profession and the world the results of their experiences, in short papers before a society especially interested in the subject discussed. These short papers often contain the most valuable information; and they, with the results of scientific investigations, really form the basis of all books on the subject, and are referred to by those who collect the knowledgment of the subject and put it in convenient book form.

It is especially important, therefore, that each member should be encouraged to put his knowledge where it may be used by all the others; and the most important work of the society, in my opinion, is this collecting of individual knowledge and putting it on record for the use of all.

From Percival H. Seward, American Boiler Co., New York:

I would say that in my opinion the American Society of Heating and Ventilating Engineers can benefit its members greatly by securing to them more opportunities to get together and discuss, or hear discussed, the various problems which are continually being met by them in the practice of their profession. The object of this society, as I understand it, is to advance the science of heating and ventilation, and also bring the standard of engineers practicing the profession to a higher level than it has attained in the past. I think the first object a most worthy one, and one that ought to appeal to all members. We all of us admit that there is not sufficient reliable data at hand from which to formulate practical details, and any means by which we are enabled to draw on each other's experience certainly, in my opinion, ought to be encouraged.

Every individual has his own ideas in regard to doing certain things, but only a few can turn their ideas to really practical use. I think it would be advisable to have members prepare papers on the subject they are most familiar with and then have them read before the society at its meetings, and also distributed in printed form to all members. By this means we would get an exchange of opinions, which is really the most rapid road to increasing one's knowledge. Only people who know little work on the principle that they cannot afford to tell anything, and if we can get the more broad minded members to come forward and read papers, giving the results of their personal observation and experiment, I think all will receive great benefit and instruction.

Apart from the reading of papers, I think the society can be of great service and benefit to its members by establishing between them a more generous feeling of good fellowship and good will one towards the other. There seems to be a feeling among heating and ventilating engineers that they are of necessity enemies as well as competitors. This feeling ought to be done away with; it is encountered in no other branch of engineering, and ought not to exist in this. I have heard engineers explaining their system of heating and ventilation before some school committee, and, not satisfied with assailing the system as planned by their opponent, they have also attacked him personally. This is entirely unnecessary, and ought not to be. Every one has his own ideas, and furthermore, has a perfect right to them.

We ought to learn to attack the ideas themselves and not the individuals that advance them.

It is cowardly and ungentlemanly, and I think that if the members of this society are brought more in contact with each other and hear their own and others' ideas freely discussed and criticised from a purely engineering standpoint, a great object will have been accomplished.

I believe the society can be of much benefit to its members by keeping as exclusive as possible.

I do not mean that to be eligible for membership one must know all that is to be known about this particular branch of engineering, as there is no use of calling doctor when the horse is dead, but let only those individuals become members who are actually engaged in the business, and who are sufficiently well posted to appreciate the discussions which will come up and so have the society's interests at heart.

We want to dispel any illusion that the society is to be used for business or personal considerations.

Such a society as we have formed ought to be capable of maintaining a suite of rooms for permanent use, where all the latest papers, books, and magazines pertaining to the profession can be found, and where members can drop in and discuss items of interest from time to time. The most convenient location for this would be in New York city, as there we will find the greatest number of resident members and probably the most visitors.

The rooms could be open all the time if desired, so that local members could drop in whenever they choose and where visiting members could be sure of meeting with a cordial reception from some other members of their profession. This would enable a better advancement of knowledge and good feeling between members than if we were tied down to two semi-annual meetings or conventions.

From Homer Adams, Barber & Ross, Washington, D. C.

In many cases the consumer and architect are not educated to appreciate a properly designed apparatus. The only question with them is, who is the lowest bidder? regardless of the merits of the plans and specifications submitted, which should be considered, especially where competitors are requested to present their own ideas. Hence, if by concerted action the American Society of Heating and Ventilating Engineers can bring about a new era by successfully demonstrating to architects and consumers the almost imperative necessity of putting the heating and ventilation of buildings in the hands of an efficient engineer, or else of looking into the merits of the apparatus specified by the different bidders and awarding contracts accordingly, then it will have performed one of the essential works towards advancing the science, and drawing out and developing new and modern features and practices with the installation of every plant.

From H. D. Crane, Cincinnati, O.:

In reply to your inquiry, I have the pleasure of replying: First—By maintaining the standard of membership, that its conclusions on subjects pertaining to our profession will be received with confidence by the public; second, by legislation, to secure the recognition of the importance of properly heated and ventilated buildings, and the consigning of this work to men competent to execute it; third, by the writing and publishing of papers on subjects pertaining to the profession, the description of new systems and improvements on old, the results of practical work,

all brought to the attention of members through monthly reports issued by the association; fourth, by semi-annual meetings held in different parts of the country, where members will have the opportunity of forming acquaintances, exchanging theories and experiences, and through these associations promulgate a feeling of perfect freedom in consulting one another when in doubt on a subject, to the end that the science of heating and ventilation will reach the importance it should in the construction of our homes and public buildings; and to be a member of the American Society of Heating and Ventilating Engineers will be a sufficient guarantee that this branch of the work will receive proper attention.

From H. B. Prather, 203 Carolina street, Buffalo, N. Y.

The American Society of Heating and Ventilating Engineers has started out under most favorable auspices, at a time when the subject of proper ventilation in conjunction with heating is coming rapidly to the front in the consideration of engineers, architects, and the public generally and at the time when the undertaking of the construction of large numbers of public buildings all over the country promises a demand for the best systems and appliances that the genius of the heating and ventilating engineers can produce. On all sides are evidences of the awakening of the public to the urgent necessity of sanitary heating, i. e., ventilation and proper heating, for the millions of children in the most formative and assimilative period of life, in the school building; for the crowded audiences of the theatres and churches, for the office and public building with its multitude of clerks, for the hospital; and last but not least, for the workshops and factories and the homes of the land. These favorable indications of the times, coupled with a positive demand for such a society in the profession itself, certainly assure the great success of the organization and point to possible ways in which it can best benefit its members. A consideration of how the older engineering societies *do best benefit* their members is also a sure guide for the new society. It would seem to the writer that this subject may be briefly grouped under three heads, as follows:

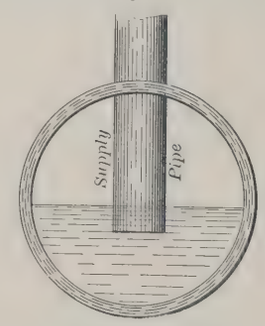
(1) By valuable and instructive papers on pertinent topics, on the various phases of the business and researches of the members; on topics having a general lesson with conditions, efforts, and results of an instructive nature. These descriptions and records of the experiments, the successes, and the failures, new ideas and schemes of the members, with their wealth of valuable data, will not only be a present benefit to the members, but in the shape of volumes of the transactions of the society will form invaluable additions to their libraries of reference.

(2) By the cultivation of a higher general standard of requirements, of moral responsibility, and of personal courtesy in business intercourse. Surely there is a field for cultivation in these lines. The "standard of requirements" should not be simply a plant that "skims" in on the specifications and barely does the work required under a favorable test; but such a standard that the highest efficiency possible from an engineering standpoint is always aimed at, this practically covers also the standard of moral responsibility. It should be the object of the whole action of the society, of its papers, its rules, and its formulations, to inculcate such a standard of requirements and moral responsibility that the name of the society and its members will become indicative of and synonymous with first-class work and the highest integrity. This brings up the point of personal courtesy in business intercourse. Any member who has been "on the road" can attest the need for reform in this line. A broader and more generous feeling should prevail. Tricky specifications with vague clauses and unfair statements may get a contract occasionally, but they never pay in the long run, and never characterize real and upright engineers. The society can, by bringing its members together, promoting the interchange of views and experiences and cultivation of high ideals, and promotion of aquaintanceship, greatly facilitate this reform.

(3) The agitation and education of the public toward the adoption of proper and specific laws on the general requirements for heating and ventilating plants for al public buildings, and especially schools and hospitals, and the education of the general public in its ideas of the standards for and elements of heating and ventilating plants in all buildings. That this is a principal subject for the action of the society will go without question. It is entirely possible to have certain legal requirements for volumes of air to be supplied, pemissible velocities and points of introduction, of its temperature and possible variations of it for the different kinds of public buildings. Some states have already shown an inclination to these innovations. The education of the general public up to the standards for sanitary heating and ventilating plants offers a broad field and a good one. In conclusion, it would seem that by a pursuance of the points and ways above referred to, the restriction of membership to successful and real engineers, and the following of high standards, the society could become of inestimable benefit to its members and a stand-by and reference in the public mind.

Injector Disease.

I came across a case of injector disease some time ago that may throw some light on similar cases, for they are apt to be puzzling at times, says Fred H. Colvin in the American Machinist. As is usual with injector diseases, they attack lifting injectors the most. They have more exposures to contagion, or else are constitutionally weak, probably the latter, in a measure. The firemen informed me "that it worked all right sometimes, but at other times it would start all right, then 'kinder cough' as though it had consumption, and stop workin'."



INJECTOR DISEASE.

Knowing that if an instrument will start right, or will work good at times, and not at others, the fault must lie outside the injector (in this instrument, if not in all, for it had no moving parts to become shifted and interfere, as is sometimes the case), I began hunting for the trouble, after trying it myself to see it "cough."

But the fireman was right; it did cough and spit in a manner indicating air in the water supply, which was down out of sight, bricked in and covered over with earth.

There was no leak in the pipe above ground, as tested by a candle at the joints, but that air must get in somehow, we hunted further.

They had told me the water came from a well, so I did not dream of trouble in that quarter, but in looking around outside the building, I saw a large pipe, about 10 inches diameter, discharging water from the direction of the boiler room, and I inquired what it was.

It was the discharge pipe to a well, sort of an overflow for surplus water, and this was what was meant by the well; the injector supply was put down into this overflow pipe, as shown in the sketch. The trouble was now clear, for at times the water surged in the pipe, and let air into the injector supply; then it would be so full of water that it would work all right at times, and at others the water would be so low it would not start at all. This was remedied by putting the supply pipe down into the discharge as far as was safe to give full opening, and there was no trouble from this source after this. For coughs of this kind a thorough examination of the suction end is in order, and with generally good success in curing the disorder.

Fusible Plugs.

Tin of pure quality is the most reliable metal for fusible plugs, because its nature is not impaired by use in a boiler, as is the case with fusible alloys. It melts at 442 degrees F. There are numerous alloys suitable for fusible plugs, the composition and melting points of a few of which are as follows. Fusible alloy composed of thirteen parts of tin and four of lead melts at 360 degrees F. Alloy composed of eight parts of tin and eleven of lead melts at 400 degrees. Eight parts of tin and seventeen of lead melts at 450 degrees. Eight parts tin and thirty-three lead melts at 500 degrees. Four parts tin and forty-eight lead melts at 550 degrees. The alloy should be employed which melts at a temperature corresponding to that of steam of the pressure to which the boiler is limited, or a little higher pressure than the working pressure. The fusible plug is then a protection against overpressure as well as against injury from shortness of water, so long as the nature of the alloy remains unchanged. In casting these alloys care should be taken to obtain sound castings, because if there be air holes in the metal it is liable to be blown out of its place when in use. The plugs should be frequently examined and renewed. Lead is sometimes used for fusible plugs. It melts at 612 degrees.

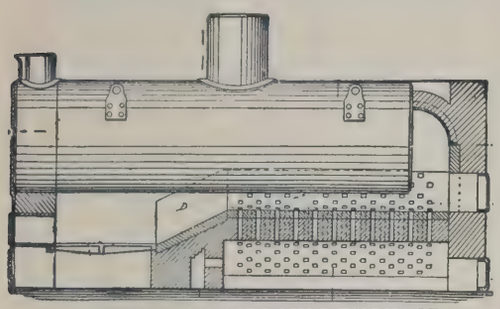
Internal Rusting of Boilers.

In a recent German paper on this subject the causes of rusting are first considered, the most important being the introduction of air with the feed-water. By placing the feed-pipe so that the feed-water enters the boiler near the low-water level, and thus meets the hottest layers of water, the air is quickly expelled, and passes out of the boiler with the steam, unless pockets exist in which it can accumulate. Such pockets are sure to rust rapidly; and it is recommended that they should be covered internally with a protecting paint or filled up with cement, provided they are not subjected to external heating. It is also recommended that the feeding should be completed before the withdrawal of steam ceases for the day, in order that the water left standing in the boiler over night may be as free from air as possible. An efficient circulation is also a means of preventing rusting, as it hinders the formation of air bubbles on the shell, which, if they remain clinging to it, cause rusting. The author is of the opinion that faulty construction is more often the cause of internal rusting than unfavorable conditions of working, and summarizes the means of preventing rusting as follows: First, while the boiler is working: (1) removing air from the feed water before it enters the boiler; (2) removing air from the water while in the boiler and preventing its accumulation in pockets, etc.; (3) addition of chemicals to the feed water; (4) protective coatings applied to the inside of the shell. Second, while the boiler is standing idle: (1) removing all moisture from the boiler; (a) by blowing it off while hot; (b) by producing an air current through it; (c) by placing hygroscopic bodies inside; (2) direct protection of the shells by painting with tar, varnish, etc., by covering with protective paints, and such an alkaline coating as milk of lime; (3) protecting the shells from the varying temperatures by keeping the draft in the flues constant, so as to prevent moisture alternately depositing and evaporating on the shell; (4) protecting the shell by completely filling the boiler with water from which all air has been expelled.

NEW SPECIALTIES.

ECKER & LAIDLAW'S FURNACE.

By reference to the cut, it will be seen that this device consists of a perforated inverted arch about eight inches away from the boiler shell and extending from the bridge wall to the rear of the boiler. Air is admitted beneath this arch from the hollow



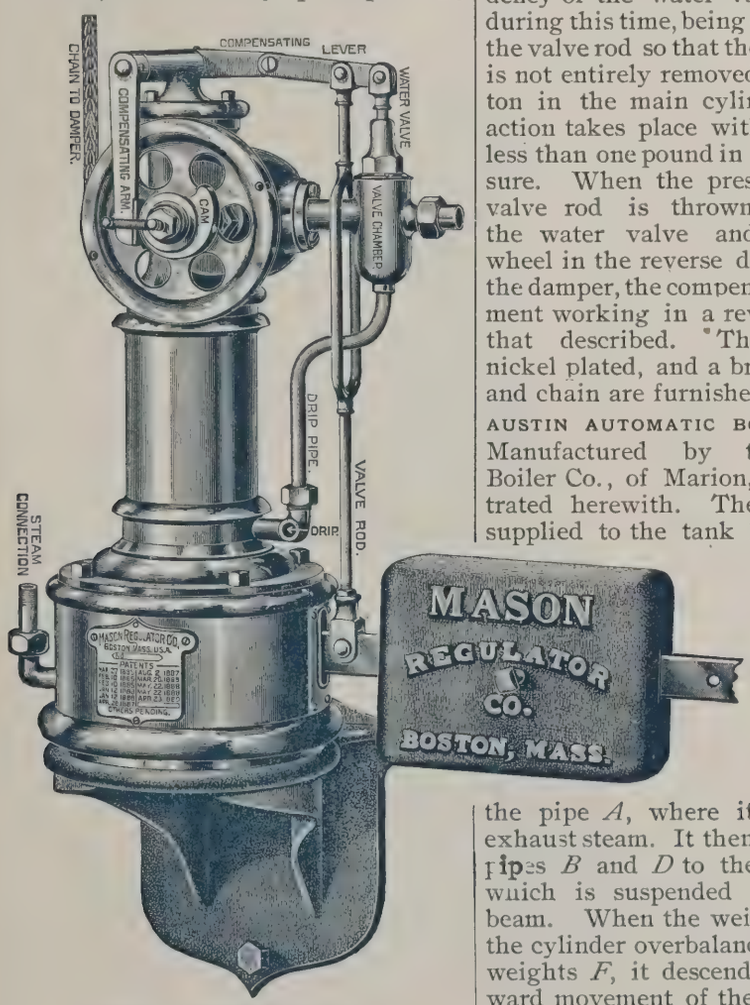
ECKER & LAIDLAW'S FURNACE.

bridge wall and, passing up through the perforations, mingles with the gases from the grate, the supply being so regulated that just enough oxygen is admitted to secure perfect combustion.

The Ecker & Laidlaw Furnace Co., 16 Front street, Portland, Ore., are the inventors.

MASON HYDRAULIC DAMPER REGULATOR.

The Mason Regulator Company, of Boston, has recently put upon the

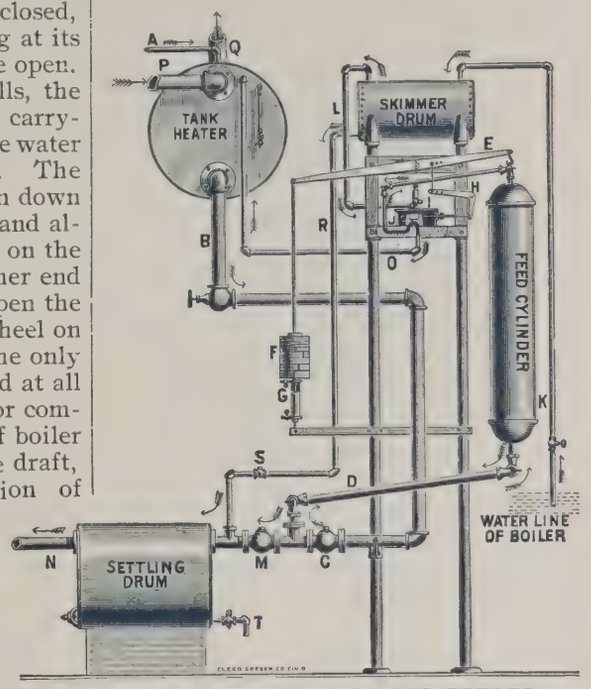


MASON DAMPER REGULATOR.

market the damper regulator shown. It belongs to that class which are controlled by variation of boiler pressure, the motive power for operating being water pressure either from the street mains or the boiler. The steam enters through the steam connection and acts beneath a heavy rubber diaphragm, though only water comes in contact with the diaphragm, as the steam in the chamber soon condenses. The regulator is shown in the position occupied when the damper is closed, the piston in the cylinder being at its lowest point and the water valve open. If the pressure in the boiler falls, the weight on the lever descends, carrying the valve rod and closing the water valve in the valve chamber. The water which has held the piston down flows off though the drip pipe, and allows the weight which is hung on the damper in the flue at the other end of the connecting chain to open the damper, pulling with it the wheel on the regulator. If this were the only mechanism, the damper would at all times either be entirely open or completely closed at each change of boiler pressure, producing a variable draft, and increasing the consumption of coal. A compensating arrangement is therefore provided, by which, as the wheel turns, a cam throws out the compensating arm. This throws down the compensating lever and, making a new fulcrum where it joins the valve rod, tends to decrease the closing tendency of the water valve, which is, during this time, being drawn down by the valve rod so that the water pressure is not entirely removed from the piston in the main cylinder. All this action takes place with a variation of less than one pound in the boiler pressure. When the pressure rises, the valve rod is thrown up, opening the water valve and turning the wheel in the reverse direction, closing the damper, the compensating arrangement working in a reverse manner to that described. The machine is nickel plated, and a bracket, weight, and chain are furnished with each.

AUSTIN AUTOMATIC BOILER FEEDER,

Manufactured by the Automatic Boiler Co., of Marion, Ohio, is illustrated herewith. The feed water is supplied to the tank heater through the pipe *A*, where it is heated by exhaust steam. It then passes through pipes *B* and *D* to the feed cylinder, which is suspended on a walking beam. When the weight of water in the cylinder overbalances the counterweights *F*, it descends. The downward movement of the walking beam actuates a slide valve in a steam chest, thereby opening a steam port in the pipe *J*, which is connected with the top of the feed cylinder. The feeder remains in this position until the water in the boiler lowers enough to admit steam into the skimmer pipe *K*. The steam passes through the skimmer drum pipe *L* into the steam chest and through the port and pipe *J* to the upper end of the feed cylinder. The steam thus admitted equalizes the pressure in the cylinder with that in

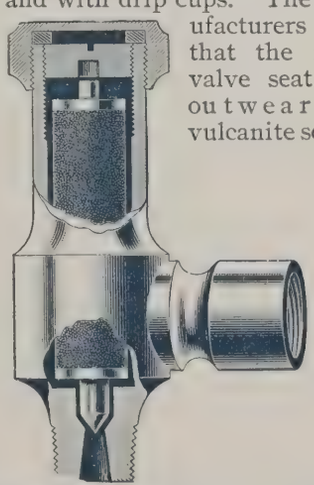


AUSTIN AUTOMATIC BOILER FEEDER.

the boiler, and the water flows by gravity through pipe *D* and the settling drum to the boiler through pipe *N*. When the cylinder is lightened by the flowing out of the water, it rises to the upper position ready to begin another cycle of movements. In this way it maintains the water in the boiler at a practically constant level.

MONASH AUTOMATIC AIR VALVE.

The accompanying cut shows a new automatic air valve just being placed on the market by the Van Auken Steam Specialty Co., 201-207 S. Canal street, Chicago, Ill. It differs from other automatic steam air valves now on the market in that it has a metal conical seat valve, with a guide to insure positive action, and can be adjusted without turning the vulcanite on the valve seat. The valve is intended for use on drip pipe connections, and with drip cups. The manufacturers state that the metal valve seat will outwear any vulcanite seat, so

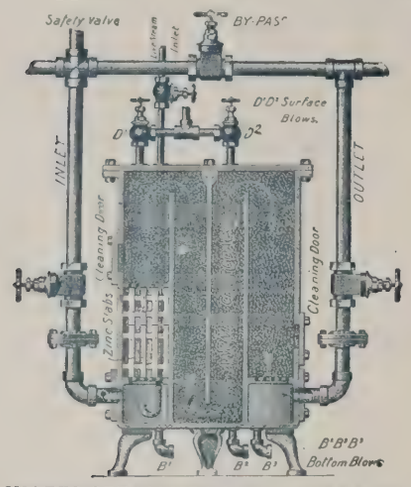


MONASH AUTOMATIC AIR VALVE.

that durability, besides positive action and sensitiveness, is assured.

WARD'S FEED WATER FILTER.

The combination zinc box and feed water filter shown by the cut presented herewith, is designed for use in connection with surface condensers and exhaust steam heating systems, effectually preventing pitting and corrosive action of the feed water and the deposit of grease in steam boilers. The apparatus is connected on the feed

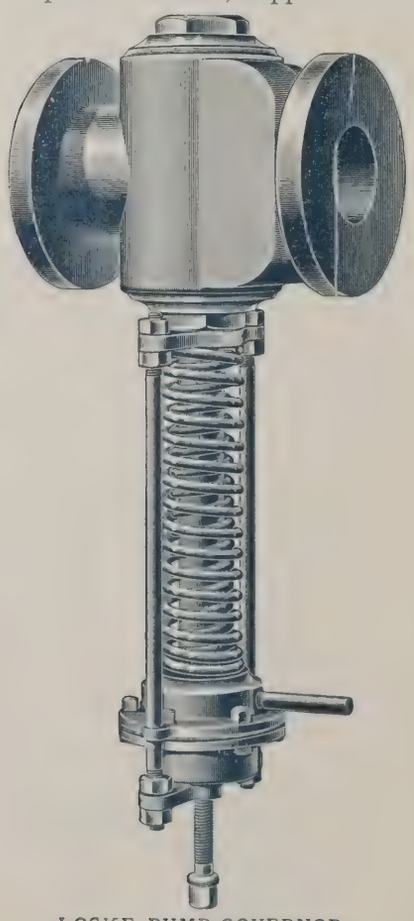


WATTS STEAM HEATING APPARATUS.

water line between the heater and the boiler, no back pressure being thrown on the engine by its use. The filtering medium is animal charcoal, the presence of the zinc preventing pitting and corrosion. Ward & Anderson, 130 Fulton street, New York, are the manufacturers.

LOCKE DIRECT ACTING PUMP GOVERNOR AND REDUCING VALVE.

This device, which is just being put upon the market, supplies a want



LOCKE PUMP GOVERNOR.

for a plain common sense regulator, one that can be used by people having little or no knowledge of such apparatus. It will be observed that it is divested of such parts as would tend to derange the operation and soon destroy its efficiency. In the first place, all pistons, cylinders, and stuffing boxes are dispensed with, and the springs placed externally, away from the destructive tendency of water, steam, and rust. All that is necessary to obtain any desired pressure is to change the screw at the bottom. If the regulator is to be used for a pump governor the small pipe from the bottom will connect with the water pipe beyond the pump. If for a reducing valve, the pipe should be connected with the steam pipe on the low pressure side. It is manufactured by the Locke Regulator Co., of Salem, Mass.

BUNDY BONNETLESS QUICK OPENING VALVE.

The special advantages claimed for the quick opening hot water radiator valve shown by the cut are that it has few parts and joints, is not apt to get out of order, is quick opening and closing (one-quarter turn being sufficient to fully open or close it), has an arrow head to indicate whether the valve is open or closed, and is cheap and durable, and, all parts being duplicated, is easy to repair. The manufacturers state that it is the only bonnetless valve on the market, and that the valve may be left partially open without danger of the circulation of the water moving the disk. It is made in five sizes, by the A. A. Griffing Iron Co., Jersey City, N. J.

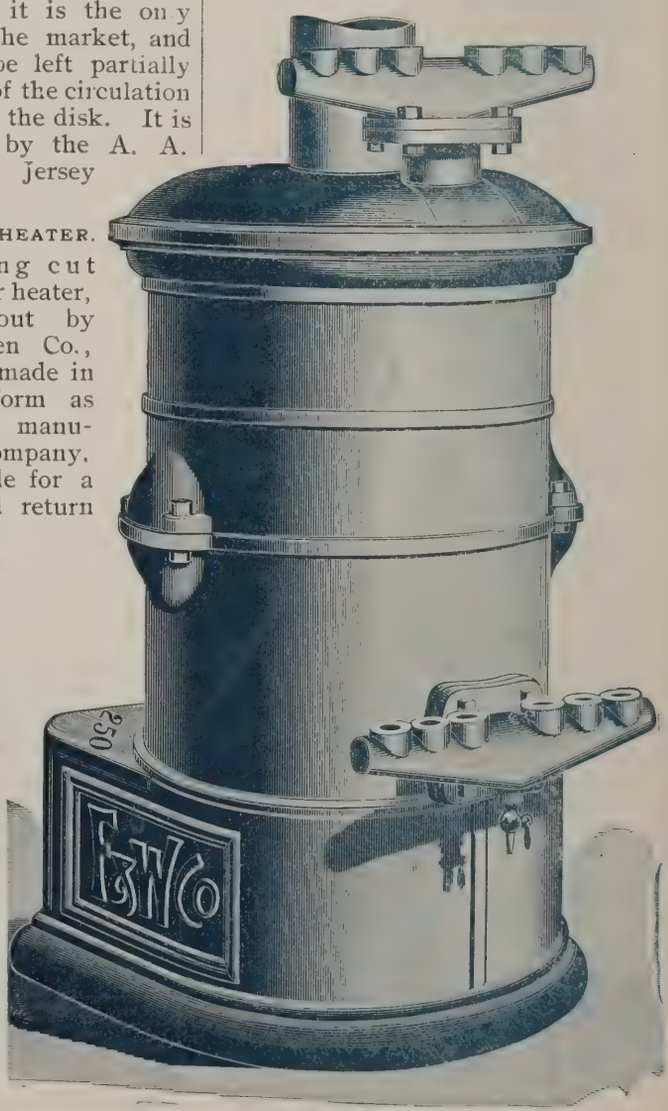
F. & W. CO. HOT WATER HEATER.

The accompanying cut shows a new hot water heater, recently brought out by the Fuller & Warren Co., Troy, N. Y. It is made in the same general form as the heater heretofore manufactured by the company, but unlike it is made for a single large flow and return pipe, the water being distributed by means of manifolds to four or six pipes, while for very large buildings two heaters can be used as twins and eight or more pipes can be taken off. The boiler is entirely of cast iron, and special claims are made for the large amount of water heating surface. The sections above the fire pot are connected with nipple joints, the hub being planed and fitted. The draw center grate is made heavy and is mounted on anti-friction rollers, so that by means of a lever shaker it can very easily be operated. It is suspended below the fire pot, affording ample space for the insertion of poker or slicing bar through the non-clinker door. The heater is made in three sizes, with fire pots measuring 20, 24, and 28 inches in diameter, adapt-



BUNDY QUICK OPENING VALVE.

ed to supply from 450 to 900 square feet of direct radiation. These are the single section boilers. The boil-

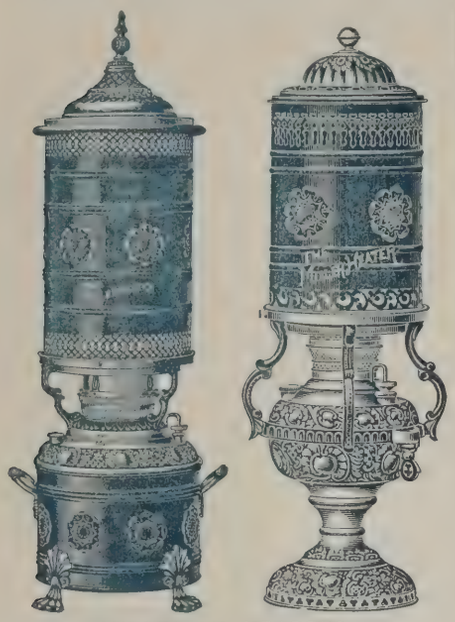


F. & W. CO. HOT WATER HEATER.

ers of double section are made with the same diameter of fire pot, and are adapted to supply from 600 to 1,200 square feet of direct radiation.

MILLER OIL HEATERS.

The two styles of oil heaters shown by Figs. 1 and 2 are selected out of a large number of original designs, to



MILLER OIL HEATERS.

illustrate the product of Edward Miller & Co., Meriden, Conn. The lamp has a central draft through a seamless drawn brass tube which cannot leak, and has a screw adjustment and plunge movement to be used at choice. It is provided with a simple and effective re-wicking device, and as the frames are quickly and easily removed the lamp can be used for illumination purposes when not wanted as a heater, each lamp being supplied with an extra flame spreader. As shown, the heaters are very ornamental in design, and, the manufacturers state, very effective in heating.

MANHATTAN GAS HEATER.

The cut presented herewith shows a gas heater for open grate fire-places with patented chamber gas burner.

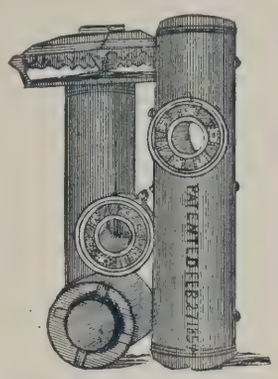


MANHATTAN GAS HEATER.

It is made with an iron front, slide damper, detachable burner, gas and air mixer with slip connections, the heater fastenings being concealed back of the rosettes. It is adapted for burning natural or artificial gas, and is made for round top fireplace openings, being from 23 to 33 inches wide by 27 to 33 inches high. The Manhattan Gas Heating Co., 903 Seventh avenue, New York, are the manufacturers.

PERFECTION VENTILATING CHIMNEY.

The device illustrated by the accompanying cut is designed for use in



PERFECTION VENTILATING CHIMNEY.

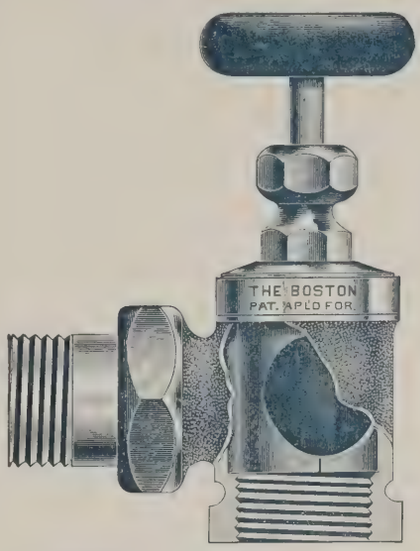
the ventilation of sleeping and other rooms and for doing away with smoking chimneys and for increasing draft. The chimney, a section of which is shown at the right of the cut, is constructed of heavy cast iron sections, adjustable to any height of ceiling or building, and contains an inner or smoke flue and an outer or ventilating flue, the heat from the smoke flue warming the air in the ventilating flue, and thus ventilating the apartments with which it is connected. S. H. Richmond, Norwalk, Conn., is the inventor and manufacturer.

BOSTON RADIATOR VALVE.

The quick opening hot water radiator valve shown by the accompanying cut, has a stop at the top to prevent springing, and is provided with a whole cylindrical plug so constructed as to make proper allowances for any expansion or friction. The valve is ornamental in design, and the manufacturers state that it has been received with universal favor wherever offered for sale, claiming it will last longer and wear better than any other valve. It is made in five sizes by the Messenger Valve Co., 19 Doane street, Boston, Mass., who state they are prepared to quote as liberal trade discounts as are consistent with a first-class article.

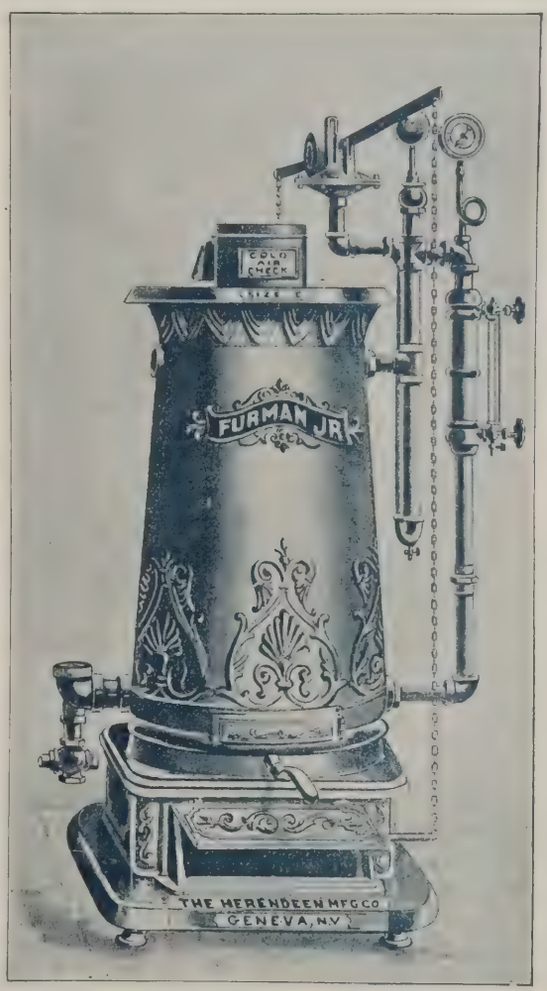
FURMAN, JR., STEAM BOILER.

The accompanying engraving shows a new steam heater recently brought out by the Herendeen Mfg. Co., of Geneva, N. Y. It is adapted for heating conservatories, small dwellings, offices, stables, poultry houses, baptistries, bath rooms, barber shops, laundries, etc., and is well and strongly made. The water and steam section is cast in one piece, and



BOSTON RADIATOR VALVE.

there are, therefore, no joints to make. The boiler is conical in construction, as shown, and is corrugated inside



FURMAN, JR., STEAM BOILER.

above the fire, the interior of the fire box also being corrugated to prevent the chilling effect of cold water against the fire and to promote combustion.

Heating and Ventilation

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SUGGESTIONS for the advancement of the American Society of Heating and Ventilating Engineers, such as are given in this issue, cannot fail to be of interest, as they indicate the directions in which the greatest development may be expected. The society is now in working order, and many applications for membership are being received. At present there are eighty charter members, all of whom are deeply interested in the success of the new movement for which they are earnestly working. The secretary, to whom all communications and applications for membership should be directed, should be addressed at Room 145, World Building New York.

THAT there is this increased efficiency in the use of low radiation can be readily shown, and the idea may prove of interest and value to the fitter, says a well-known heating engineer. The reasons are plain, and can be readily grasped. The explanation rests on a principle recognized as one of the laws of heat, to the effect that if two bodies of different temperatures be placed adjacent or in contact, heat will pass from the warmer to the cooler body until such time as an equilibrium shall be established, and both bodies represent an equal temperature. The amount of heat thus passing in any instant of time will be the greater, the greater the difference in temperature between the bodies.

THE POSITION in which low radiators may be placed is also an argument in favor of their more extended use. There can be no question but that the most favorable spot in a room for placing direct radiation is exactly under the windows on the exposure. There is always a strong down current of cold air before the window, and placing the surface where it can meet this air current before it gets into the circulation of the room gives an opportunity of checking the current, which would otherwise pass downward constantly, maintaining a flow of cool air over the floor, and forming a consequent source of annoyance and discomfort.

THE MAIN argument, of course, against the more extended use of low radiators is their cost, but in point of fact the increase in efficiency keeps pace very nearly with the increased cost, and thus tends to make all hights equally expensive. In most instances, too, there can be little question but that low radiators can be made to make a much more presentable appearance in a room than any other arrangement of direct-heating surface, and this, with an understanding of their increased efficiency and consequent lowering of price, should lead to their more general introduction.

SPEAKING of the time to stop advertising, a contemporary says that it should be discontinued when the population ceases to multiply, and the generations that crowd on after you and have never heard of you stop coming on; when you have convinced every one whose life will mingle with yours that you have better goods at lower prices than he or she can get anywhere else; when you perceive it to be the rule that men who never advertise are outstripping those in the same line of business who do; when men stop making fortunes right in your sight solely through the discreet use of this mighty agent; when you forget the words of the shrewdest and most successful business men concerning the main cause of their prosperity; when every man becomes a creature of habit so thoroughly that he will buy this year where he bought last year; when younger and fresher houses in your line cease starting up and using the newspapers in telling the people how much better they can do for them than you can; when you would rather have your own way and fail than to take advice and win; when nobody else thinks it pays to advertise.

A COMPETITION is to be opened at Paris to determine the best means for suppressing the smoke produced in steam boiler furnaces. Persons wishing to compete must deposit at the Prefecture of the Seine, Paris, before November 1st, an explanatory and justificative notice of the process employed, accompanied by drawings and statements of results attained or expected by its use in the suppression of smoke and economy in fuel. The notice must also indicate the cost for applying the process, the limits between which the temperature of the fuel in the volatile parts must be kept, the kind of boiler to which the process can be most advantageously applied, and especially f it is adapted to rapidly varying firings. From the propositions submitted, a commission will select those to be subjected to actual test. The conditions governing the tests will be announced later. All expenses, except those for fuel and labor, will be met by the competitors, and three awards of 10,000, 5,000, and 2,000 francs will be accorded, if there is occasion to do so, to the inventors of the best processes. Moreover, the city of Paris may buy the apparatus to which awards shall have been granted. Powell & Colne, 107 Liberty street, New York, will furnish information to American inventors desiring to compete.

Erection of Steam Plants.

It seems to be too often the case, says Dixie, that architects design and erect buildings for manufacturing and business purposes without regard to the work and space necessary to the proper erection of the steam plants they are to contain. Serious errors, involving great trouble and expense, occur much more frequently in this respect than is commonly supposed. Again, many architects are not sufficiently careful in considering contingencies that may be needed in case of repairs or the removal of machinery.

Not long since I witnessed the efforts of a gang of men trying to get a large horizontal boiler into the basement of a new building through a window. It became necessary to remove a large quantity of brickwork in the wall before the work could be satisfactorily done. In the new United States building at Chattanooga, the extra expense entailed by oversight or neglect in this matter, fully doubled the cost of erecting the heating and ventilating plant. It is no uncommon thing to see that an architect, in his plans, has placed the engine so near the walls that getting out the piston will involve long and serious trouble.

Engineers in charge of steam plants will constantly point out the difficulties they encounter and the inconveniences they have to suffer through lack of foresight or from ignorance in the planning and locating of the machinery. It seems to be considered that basements are the proper places for boilers, because, principally, coal and water can be brought close to them. Here, too, good foundations and plenty of room can be had, but artificial light will have to be depended on day and night. It is here, however, that soot, ashes, and dirt will accumulate, and be both a source of annoyance and danger, if they be not regularly and entirely removed. Yet how many basements can be found where proper provision has been made for this purpose?

But a basement is no place for an engine, unless completely separated from the boiler-room by a good partition.

An engine-room requires ample space for repairs, plenty of light, and good ventilation. This crowding steam machinery into dark, ill-ventilated and damp cells in basements is all wrong. It is false, mistaken economy as well as inhuman and debasing to the engineers and firemen. No man in such a place can take proper care of a plant; no man who has true regard for his work would go into such a place, excepting in case of dire necessity.

I do not expect professional architects to be practical engineers, but I do maintain that in planning to receive steam machinery they would serve the true interests of their clients far better by consulting a competent engineer as to the greatest facilities and convenience.

New Cremating Water Closet.

A Seattle inventor, says the Pacific Builder, has produced a cremating water-closet which he believes is likely to come into extensive use. The closet has been in use for some time as an experiment in the Sound City, and is recommended very highly by the school board of that place after having seen it thoroughly tested. It is, therefore, evident that the patent is something more than a caveat and a theory. But unfortunately for the inventor, he has followed in the wake of a so-called patent dry closet system that has brought condemnation upon itself and suspicion upon everything else in any way suggestive of it. The Seattle invention, however, is not the Smead closet. It differs in essential particulars, although intended to accomplish the same results. The new closet opens upon a revolving disk that is turned one-eighth around each time the closet lid is raised. And thus after the closet has been used eight times the revolution of the disk is completed.

As a result of this revolution the fecal matter is deposited over eight times as much surface as would otherwise be the case, which renders cremation easier. The new closet differs from the old in that the cremating heat, which is generated from hot water, is conducted to the closet. After the disk has completed its revolution its contents are automatically removed. It is claimed that experiments have shown that the cremating is carried on so successfully that nothing but cinders remain after the process.

The precaution is taken to have all parts of the closet beneath that can possibly come in contact with the fecal matter constructed of iron to prevent foul odorizing. It is possible that the Seattle inventor has discovered the boon long sought for, but he must not be surprised if architects and builders continue skeptical, even after some apparently successful experiments

The theory of the cremating closet is a fine one. Sewers, where such exist, purge out no impurities, but merely carry the foul excretions from one location to another. To propose the complete annihilation of this matter is to suggest a most happy consummation. But how to do it, that is the question. To the ordinary observer it would seem as though the Seattle invention might be weak in at least one particular. The movement of the disk is subject to the using of the closet. If the closet is used often the disk soon completes its revolution and the contents are removed. But if the closet is used but seldom, much time is allowed for the fecal matter to cremate on the disk.

Hence it would seem as though the closet was calculated to prove least efficient when most needed, and most efficient when little needed—or at least, when slight demands are made upon it.

Increasing Use of Oil as Fuel.

According to Indian engineering, the utilization of the heat force of oil as a fuel is increasing, the reduced price of petroleum and the cheap carriage of it in tank-steamers instead of barrels, greatly stimulating its use. As fuel for steam boilers at sea there are certain economies in the labor of stoking which encourage its use, but the choice depends on variable circumstance, such as the relative cost of oil and coal at any particular place, the certainty of finding a store of oil ready at ports of call, and finally, in the absence of risk in the storage and use of oil. At present it is only at places such as the Caspian Sea, or on the Volga, where oil is cheap and coal very dear, that boilers are made for oil fuel exclusively. The explosive force of vaporized oil, without the inconvenience and waste of steam boilers, is more immediately interesting to engineers. During the last two or three years oil engines have been greatly improved, and are taking a more important position among motors which may be relied upon. Except in countries where import duties are imposed, the cost of petroleum has been brought down to a low price, and as the consumption in an oil engine only ranges from one-sixth of a gallon per effective horse-power per hour, the oil motors are cheap as well as convenient. Not only as fixed machines, but as motors for launches and tram cars, oil engines are likely in the future to compete with steam and electric engines.

The actual number of steam boilers in New York at the beginning of the present year, says Architecture and Building, either in active use, unused, or exempted from the annual test, was 8,073. Of these 6,812 are stationary boilers within buildings or factories; 616 are portable boilers, chiefly in use for building purposes; 169 are attached to pile drivers; 72 are in use on scows; 15 in grain elevators; 32 on street rollers, and the remainder on ships, barges, or steam dredges.

Clinkering depends upon two things, says an exchange,—the temperature at which the coal is burned, and the composition of the ash. The fact that a coal does not clinker may be due to its impurity, the poor quality of the coal preventing it from making a fire hot enough to fuse the ash. On the other hand, a very pure coal may clinker, because it burns at a high temperature and melts its ash. A coal must have heat enough to melt the silicates it contains in order to make clinker. Generally the more bases there are in the ash the more fusible it is. Two coals, either of which burns without giving much trouble on account of clinkering, may clinker more if they are mixed, the reason being that the combination of the ash of both is more fusible than the ash of either separately.

LETTERS FROM PRACTICAL MEN.

Correspondence from practical men upon topics of interest relating to Heating, Ventilating, and kindred subjects, will find a place in this department. The editors, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

American Society of Heating and Ventilating Engineers.

I had the pleasure of attending the meeting for organizing the American Society of Heating and Ventilating Engineers, and there met the gentlemen who endeavor on all occasions to make matters warm for their clients. I was much impressed with the vim and earnestness displayed to advance the cause of the society. I write to offer a suggestion for the consideration of those who may attend the next meeting. I believe it would redound to the benefit of all if a sinking fund were created for the purpose of equipping a laboratory with necessary apparatus, so that standard data could be obtained on the many points of the different systems of heating, and experiments made for the benefit of members. This would also be conducive to giving a high value to such data emanating from this society, and would be beneficial in many ways. An official seal, emblematic of the work of the society, to stamp all official papers, should be adopted, and later on, if desired, an official badge button, a facsimile of the official seal, could be issued to members. There is no doubt but that every member can at the next meeting furnish ideas which will be beneficial and help to advance the cause of this society. Its purpose and business aims place it in the front rank of modern progression. I predict for it a high place among the engineering societies of the world. J. J. Wilson.

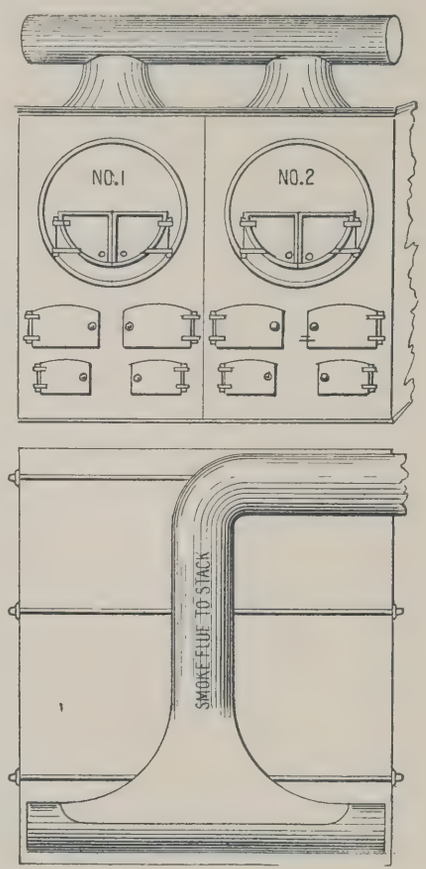
Large Steam Pipes.

What is the advantage in using riveted steam pipes instead of lap welded ones? I am aware of the fact that the latter are made in sizes only up to 15 inches in diameter, but Mr. Charles H. Manning, in an article on the manufacture of large steam pipes, states that he used riveted pipes as small as 12 inches diameter. On arriving in this country three years ago I was surprised to find that lap-welded pipes were not made larger than 15 inches, although in Germany they are made up to 39½ inches diameter, with welded flanges, and are tested to a pressure of 2,250 pounds per square inch. Tees, elbows, etc., for these pipes are also made of wrought iron and in one piece. The firm of W. Fitzner, Laurahutte, Germany, makes these pipes in lengths of 66 feet, with flange welded on, and welds guaranteed to be 90 per cent of the strength of the plate from which the pipe is made. During the year 1893 the firm named manufactured 2,300 tons of such pipes, as reported in a recent number of the *Zeitschrift des Vereines Deutscher Ingenieure*. Tests of these pipes have shown without exception that the welded joint has a strength nearly or quite equal to that of the plate. Welded boiler shells are coming into more extensive use in Germany since the boiler insurance companies have commenced to insure boilers with such shells, though they allow only 70 per cent of the strength of the plate for the weld.

Jos. Scheuereeker.

Flue Connection.

Inclosed find sketch of a battery of two boilers, about which I would like to ask a few questions through your columns, and probably some of your readers can enlighten me. The boilers are 48 by 14 inches, tubular. The grate area of the boilers is 25 square feet; neck, from boiler to smoke drum, 14 by 30 inches; drum and smoke flue to stack, 33 inches in diameter, and connected as shown in the sketch. There have been three sets of different kinds of grates, and in all cases the coal will clinker on the grates. There is a single boiler in another plant, 54 by 16 inches, tubular, set as per sketch, and it has had two sets of different kinds of grates, but persists in burning the most coal on the side nearest the stack, bridge wall, and back arch. Would some of your readers give reasons for this?



FLUE CONNECTION.

Chatham.

Feed Water Heating.

About a year ago I was in a quandary as to whether to put pipes in my smoke box or not, but after meditating awhile I decided to go to work and put the pipes in. I have nine boilers, with 400 square inches more area in the smoke box and stack than in the boiler flues. I feed through a 2½-inch return pipe heater, in which I can get the temperature up to 170 degrees. But when I made the change, I branched off after passing through the heater with a 3-inch pipe into the stack and smoke box until I got 125 linear feet of 3-inch pipe in. When putting the pipe in I placed a tee between the heater and stack, in case it would be necessary to put an air chamber on, which after a day's run proved to be the case. I put the air chamber on by unscrewing the plug and screwing in a piece of 3-inch pipe about three feet long with a cap on top end. I have had it in use for over a year, and it gives good satisfaction.

I get the water up to 205 degrees, and I cannot see that it injures the draft. You will notice by the sketch that a trap is on the return pipe from the smoke stack box to the boiler. With the trap I find that I can catch a great deal of sediment which otherwise would pass into the boilers.

J. A. McRae.

Top Feed for Boilers.

I am about to fall in line with the rest and change my boiler feed from the blow-off, where it now is, to the top of the boiler, as so strongly advocated by many recent letters in this department of the paper. When we put in the boiler I have charge of we were greatly rushed and had to get it going as soon as possible, so the feed was connected to the blow-off, as it saved the time and trouble of drilling and tapping a special hole for the feed. Now I shall make the change as I have time to do so.

I would like to ask if it is necessary to rivet a piece on the boiler to increase the thickness where the hole is to be drilled, which will be in the top of the shell. I intend to cut a long thread on the pipe, so as to have enough thread inside upon which to screw a short piece of pipe reaching down to the tubes. There I will put an elbow, and run the feed pipe to near the rear of the boiler, in the manner described by one of your correspondents. The boiler is 18 feet long, 66 inches in diameter, has 59 four-inch tubes, and a shell of ⅜-inch steel. I should be glad to know what your correspondents think about increasing the thickness at the feed inlet.

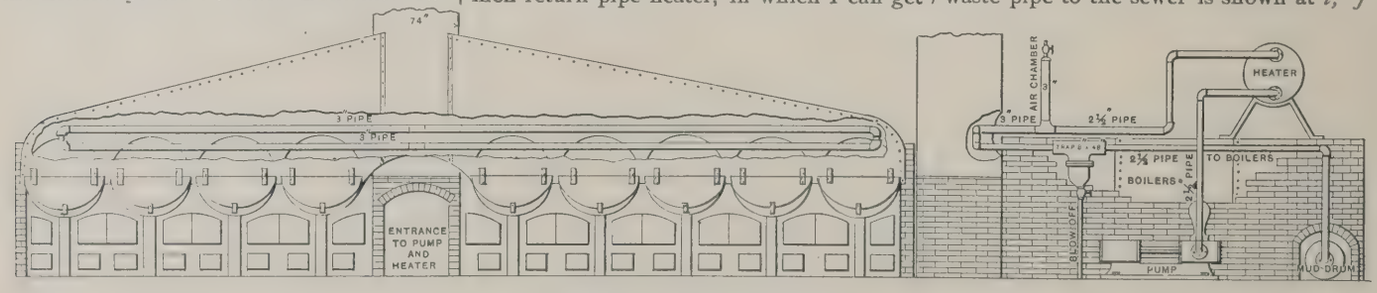
Can any one suggest a way of making a cheap home-made damper regulator?

J. K. S.

Boiler Room Piping—Top Feed.

My boilers, two in number, are fed by four plunger pumps in the basement of the engine room, with an injector in the boiler room for extra service when required. I have all the pipes and valves grouped on the furnace wall, as shown in the accompanying diagram, and I find the arrangement very convenient, as all the valves are near together and within easy reach.

In the diagram, *a* is the feed pipe from the pump, with two tees and a nipple at *b*, connecting with a Worthington water meter *c*, and through pipe *d* back to pipe *a*; *e* is a check valve to prevent hot water from passing back into the meter. By closing valve *f* and opening *g* the feed water will pass through the meter. This is always done when trying new coal, and at any time when it is desirable to know how much water we are evaporating. There is an overflow valve at *h*, which is used when the shutting off of one pump would not give water enough and the number in use would furnish more than was required. The waste pipe to the sewer is shown at *i*; *j* is the injector, *k* the injector feed pipe, *l* the steam pipe to the injector, *m* the suction, taking water from the main; *n* is a water pipe leading to the sink *o*, *p* is a water heater made from an ordinary tee and bushing, the same as a home made siphon, and taking steam from the injector steam pipe through pipe *q*. The pipe at the sink has a ¾-inch hose connection, to furnish water for the various uses of an engine and boiler

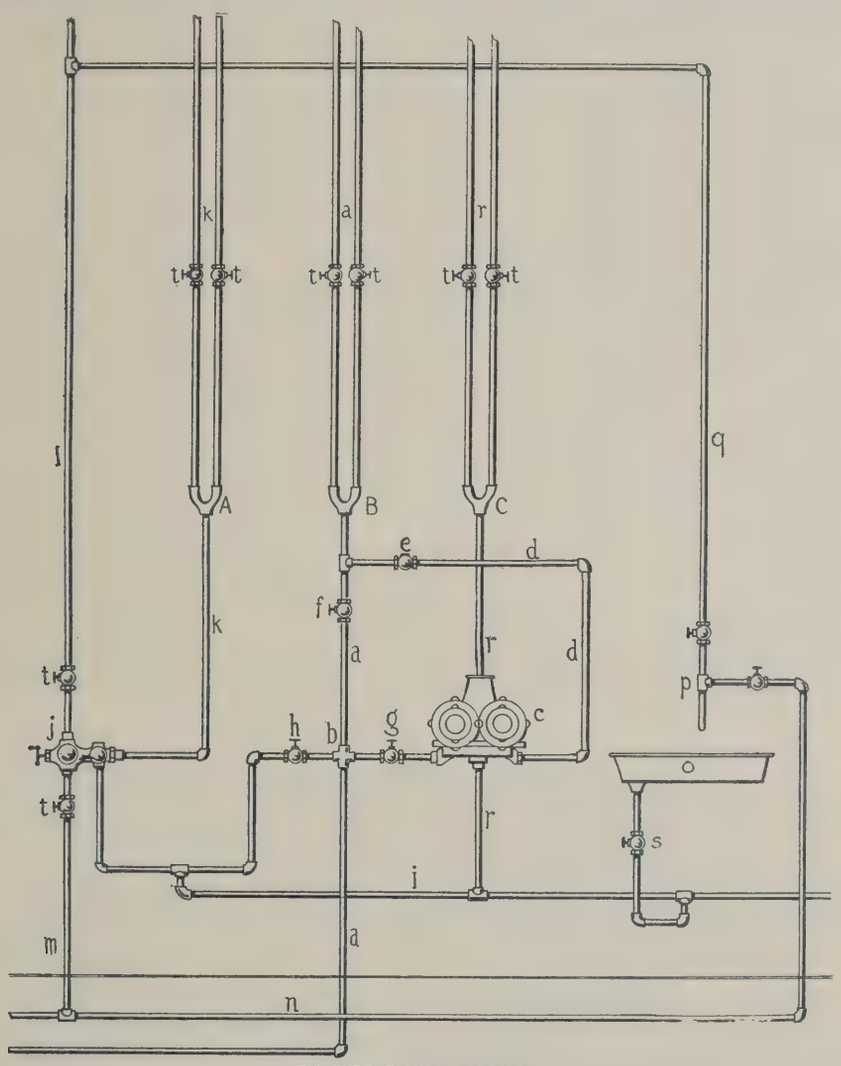


FEED WATER HEATING.

room, and as we can heat the water as hot as desired, we find this arrangement very useful. Surface blow-off pipes are shown at *r*, connecting with the waste pipe *i*, to which are also connected the injector overflow pipe and the waste pipe from the sink.

In the latter is a valve *s*, to prevent the escape of steam and water when using the surface blow-off. At *A*, *B*, and *C* are back outlet return bends, tapped left-handed, and connected by right and left nipples with the valves *t*, the use of which is obvious.

The check valves are on top of the boilers, and the injector and pumps feed into the boiler through the same pipes. There is a tee on top of the nipple that screws into the boiler, and the feed pipes connect to the tee with an angle valve as close to the tee as possible, to serve as a stop cock in case of accident. I use top feed, but the pipes are carried well below the water line, so they give no trouble; but the surface blow-off pipes are also tapped in at the top of the boiler, and if the water line is allowed to



BOILER ROOM PIPING.

fall below the ends of these pipes they make noise enough to attract the attention of any person in the building.

John A. Cavanaugh.

Leaky Boiler Tubes.

Seeing in your September issue, under the head of Letters from Practical Men, a query as to the cause of leaky boiler tubes, I take the liberty of replying.

In 1884 I placed a hot water heating apparatus in a large public building (about 4,700 square feet of radiating surface), using two horizontal boilers with 4-inch tubes. The job works splendidly and gives the best satisfaction, amply heating the building in the coldest weather (20 degrees below zero), and the hot water thermometer on the boiler standing at 180 degrees F. This, it will be admitted, is a very satisfactory showing.

After the boilers were fired one winter, 1884-85, during the month of August following they were noticed leaking, and upon examination it was found that the tubes had given out, and a large number (some sixteen, I think) had to be removed. Upon closer inspection they were found full of small holes, varying in size from a pin-head upward. The holes or corrosion commenced on the fire side of the tube and worked inward toward the water side.

The boilers were kept full of water during the summer season, and it had been the custom of the fireman to burn accumulated papers and tickets in the furnaces periodically. Often a fire would be smouldering underneath them for hours. The tubes being damp and sweating, the smoke would condense and leave a tarry thick, substance in them.

After considerable investigation I traced the origin, or rather thought the cause might be in the burning of the old tickets and papers, which caused a pyroligneous acid to form, thus eating out the tubes. We had the contents of the tubes that were taken out analyzed, and the chemist reported traces of this acid.

The burning of the tickets and old papers was then discontinued, and the apparatus fired during the winter of 1885-86, doing all right, but in the summer the care-taker of the building drew the water off the apparatus and when he was refilling it in the fall he discovered more leaky tubes, and upon examination nine more had to be replaced.

In two other cases I have had similar experiences of the tubes giving out of horizontal tubular boilers used for hot water heating, the shell being full of tubes and set in the ordinary way, in brickwork, only no paper or other refuse material was burned under them. I might add that the boilers were all of the best material and workmanship, and tested to 150 pounds hydraulic pressure per square inch

The kind of fuel used in firing all these boilers was soft coal of a sulphurous nature.

One of the boilers in question was fired only about four weeks when sixteen of the tubes gave out. The water used in the boilers was of good quality.

Investigation proved that the leaking or eating out of the tubes was caused by firing the boilers with bituminous coal strongly impregnated with sulphur, sulphuric acid, which was very destructive to the tubes, being produced.

I had the tubes of three horizontal tubular boilers give out from the above cause, and in almost the same manner described by your correspondent. The theory which I believe to be correct is that the deposits of soot and fine ashes became lodged in the tubes, and being of a sulphurous nature, and the apparatus being kept full of water in the summer time (which is correct), the tubes become damp, and sweat from difference of temperature of the atmosphere, thereby producing sulphuric acid, which eats the tubes from the fire side, giving them a pin-hole appearance and causing them to leak.

Your correspondent does not state what kind of fuel he is using, but I venture an opinion that he is using bituminous coal of a highly sulphurous character. I think he will probably find my solution a correct one.

Pyroligneous acid, or in fact any acid, will assist in the destruction of the wrought iron tubes of a boiler, provided it is condensed within them. I am of the opinion, however, that trouble is primarily caused by the use of impure and sulphurous coal. The irregular pitting and eating of the tubes from the fire side is unknown with the use of hard coal. With some grades of soft coal, however, it is a common occurrence. The tubes above mentioned seem to have given out in an exceedingly short time when compared with the life of tubes in a steam boiler, but this is probably due to the fact that the mass of comparatively cold water within the boilers of a hot water apparatus always acts as a condenser of the vapors of combustion. Bituminous and other products are always found within such tubes, principally on the lower side. When the fires are strong and the circulation of the water good this is lessened, and when the temperature of the water within a boiler passes 212 degrees, as in a steam boiler, or is sufficient to prevent the condensation of watery vapors, all disappears but a coke-like deposit. This in the case of a hot water apparatus, then, is nearly at all times to be expected, but with steam boilers the mischief or deterioration goes on only when getting up steam or with banked fires.

I might further state I was informed about three years ago that the boilers about which I am writing gave so much trouble with leaky tubes that they were retubed with copper tubes, but as the chemical effects on copper tubes is so well known, the destruction was still more marked than in the case of the wrought iron tubes.

Change of coal is the remedy, and in keeping the surfaces clean and dry during the period of rest of the boilers. Try the use of anthracite coal, or some good soft coal that is known to be "easy" on boilers, and see the effect for one winter, making sure the tubes have all been restored first.

I will be very glad if I have diagnosed this case correctly, and would say that I have spent considerable time in investigating, but finally solved the problem as to the cause of the trouble to my own satisfaction. The above comments are based on my experience; still there is so much experience in the use of boilers unrecorded that I should be glad to have the views of your readers on this subject.

John A. Fish,
Vice-Pres. Gurney Heater Mfg. Co.

TRADE NOTES.

The New Haven Heating & Plumbing Co. have been very successful in introducing their Rapid Circulator, which they have put on the market this year.

The Walker & Pratt Mfg. Co., of Boston, are doing the steam fitting for the new house of J. Pierpont Morgan, New York city.

The Walworth Construction & Supply Co., Boston, are doing the fitting for the new electric light plant at Marblehead, Mass.

Foskett & Bishop of New Haven, Conn., are rushed with work, really have to refuse orders. Their business is way ahead of last year.

Buerkel & Co., of Boston, are doing the steam fitting for Mr. Houghton's new residence, North Adams, Mass.; the Park street church, Boston, and the West street almshouse, Boston.

Lynch & Woodward, Salem, Mass., have secured contracts for the heating apparatus for the City Hospital buildings, at $62,000; the residence of Samuel R. Conant, Lincoln, R. I.; school house, Boston; Marine barracks, Charlestown Navy yard, and Wheeden building, Providence, R. I.

The Locke Regulator Co., of Boston, state that their business has more than doubled in the last three weeks, while their mail has trebled. They have just received an inquiry for their pump governors from Alexandria, Egypt, showing that their line of apparatus is considered as the standard all over the world.

The Bedell Brothers, of Haverstraw, N. Y., have secured the contract to heat the Rockland County court house and jail, using two No. 327 Richmond eight-section steam heaters. Headley, Leavitt & Co., of Trenton, N. J., are heating the almshouse at Trenton with a No. 327 twelve-section Richmond hot water heater.

We are very much obliged to Mr. M. C. Huyett, heating and ventilating engineer, Monadnock Block, Chicago, for an exhaustive analysis on mechanical heating and ventilation. Mr. Huyett is an old-time engineer, and has had long experience in this line of work. Any of our readers desiring information will receive most pleasant treatment upon consulting him.

The Manhattan Gas Heating Co., 903 Seventh avenue, New York, one of whose round top gas heaters is described in this issue, manufacture a line of 35 different sizes and styles of square top gas heaters for open-grate fireplaces in iron, brass, antique brass, nickel and copper. The regular sizes carried in stock are 24 by 30 and 30 by 30 inches, special sizes being made to order at short notice. Particular attention is called to the patented chamber gas burner used on their heaters, gas and air being thoroughly mixed and super-heated in the chamber before coming in contact with the flame in front of the burner, thereby insuring perfect combustion, a brilliant fire, and an intense heat.

The Herendeen Mfg. Co., Geneva, N. Y., state that there are now some 10,000 Furman boilers in successful use, according to the announcement of the company recently made.

The A. A. Griffing Iron Co. of Jersey City, New Jersey, are informed by telegram that they have received the gold medal, the highest award that can be accredited, at the Antwerp Exposition, on Bundy radiators.

The Powers Regulator Co., 36 Dearborn street, Chicago, have issued a new catalogue upon the Powers system of controlling temperature for schools, churches, etc. We have mentioned this, we believe, in our former issue, but as the apparatus is one for which there is constant demand, the address of the company is again given, so that our readers will not forget them when desiring regulators of this kind.

The Garden City Fan Co., of 43 Clinton street, Chicago, send us their new catalogue of exhaust fans, pressure blowers, hot blast steam heating apparatus, dry kilns, boring machines, etc., of which they are patentees and sole manufacturers. This company has been actively engaged in the fan business for fifteen years, during which period they have manufactured and sold thousands of their machines. The catalogue includes suggestions to correspondents when ordering or making inquiries, and describes with illustration their different makes of apparatus. They have endeavored to make this catalogue so plain that all could understand. Their goods are all guaranteed, and the references in the back part of the catalogue are of the best. If you are interested in this line of work, send for this catalouge, which will be mailed free.

The Paul Steam System Company, with offices at 10 and 12 Federal street, Boston, has been organized with a capital stock of $1,000,000. The officers are: Edgar W. Anthony, president; Frank H. Monks, treasurer; Andrew G. Paul, general manager; directors, George N. Talbert, Edgar W. Anthony, Frank H. Monks, Charles H. Olmsted, A. F. Breed, S. N. Brown, A. G. Paul. The Paul system has now been in use in New England for two years or more, and has proven most successful; in fact, the business of the company has increased so largely that it became necessary to increase the capital stock in order to fulfill the many new contracts with dispatch. The company own and will operate the different patents for heating, drying and utilizing exhaust steam, and for using steam above or below atmospheric pressure, removing water and air from heating systems and drying cylinders, used in mills, factories, public buildings, residences, paper machines, lofts, dry kilns, blower heating, etc., granted Andrew G. Paul, Wm. P. Skiffington and others. The company will also do a general steam engineering business, make designs for all kinds of steam plants, guaranteeing results of same, examine plants, and recommend the most economical plan for the use of steam for either power or heating. Every one using their systems will be fully protected.

The Locke Regulator Co. of Salem, Mass., have in use in the city of Fall River, Mass., alone, 94 damper regulators, and have over 3,700 in use in this and foreign countries. This regulator is a great coal saving device.

The Jewell Belt Hook Co., of Hartford, Conn., are having a very successful trade on Potter's patent belt hooks, made by them. This hook is made of malleable iron and never fails to clinch well and hold the belt. By its peculiar construction, the smallest possible section of the belt is cut, while almost the entire width of belt is cut while almost the entire width of belt is retained as holding surface. All the heavier sizes have the strengthening ropes across the back. They can be put on by anybody and the belt run while a skilled man is preparing the belt to be laced. They cannot be put on wrong, as it makes no difference which way the teeth are clinched.

The Buffalo progressive lumber dryers are well and favorably known by all Americans interested in wood-working industries, and their sales also extend to many foreign countries. They are unsurpassed for drying lumber in any form. Special study of the different kinds and sizes of lumber to be seasoned is made by the manufacturers of these dryers, and the various apparatus are designed with reference thereto. The Buffalo Forge Co., Buffalo, N. Y., recently received an order for a large outfit to be shipped to Reval, Russia, for drying veneers. The parties buying the outfit have tried various plans of seasoning this material, with very unsatisfactory results, but after investigating a plant previously installed by the Buffalo Forge Co. were so well pleased with the outfit that they found it unnecessary to look further.

The American Radiator Co. sends us their pocket catalogue for 1894, which presents, as the company says, an unrivalled assortment, which is the result of an experience covering a period of more than a quarter of a century and represents the best mechanical ability that modern science has enabled them to procure. The plants of this company cover an area of twenty acres, filled with the most modern machinery. They carry immense stocks at their different factories, and also at their branches in various sections of the country, and are therefore enabled to serve the wants of their customers with exceptional promptness and dispatch. This pocket catalogue shows illustrated on pages 6 to 38 inclusive, the different radiators made at their Pierce plant in Buffalo, N. Y., with a complete description of them. Illustrated on pages 40 to 54 inclusive are the radiators made at their Detroit plant, and on pages 57 to 87 inclusive, the radiators made at their Michigan plant, Detroit. On page 88 directions for decorating radiators are given, which is handy information for the fitter. After that follows a description of their japans, telegraphic code, tapping Instructions, and general miscellaneous information. This catalogue can be had by addressing the company at any of their offices.

(*Continued on page xv*).

WANTED.

Announcements in this department will be inserted at the uniform rate of twenty-five cents per line. For five or more insertions of the same advertisement we make a discount of 10 per cent. Calculate on nine words to a line.

WANTED.—Several first-class tinners, who are competent to do general furnace work. First-class sober men can have steady employment. Call or address The Peck-Williamson Co., Cincinnati, Ohio.



FAR BETTER AND CHEAPER THAN RED LEAD

Makes a tighter joint than red lead, that can be opened with perfect ease many years after.

Invaluable for all steam, gas and water piping, and equally useful for smearing gaskets on flange joints of meters, traps, and for bolts, screws, etc.

JOS. DIXON CRUCIBLE CO.,
JERSEY CITY, N. J.

THE CELEBRATED SANITAS TRAPS

ENDORSED BY SANITARY EXPERTS AND LEADING PLUMBERS.

SANITAS Traps are used unvented in many of the principal cities of the United States, making a great saving to the Plumber and to the user. The Sanitas is the only Trap that will stand both syphonage and evaporation and hold its seal under the most adverse circumstances. Plumbers interested in giving their patrons the best will invariably give preference to the Sanitas Traps Made in Lead, White Metal or Iron. Send for Special Circulars.

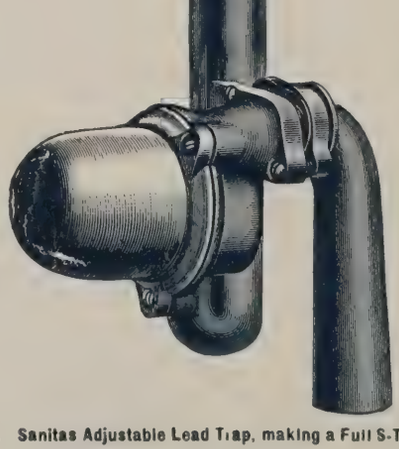


Fig 9. Sanitas Adjustable Lead Trap, making a Full S-Trap.



Fig. 11a. Sanitas Brass Trap.

Smith & Anthony Co., MAKERS Sanitas Plumbing Appliances.

48 to 54 UNION STREET, BOSTON.

56 BEEKMAN ST., NEW YORK. CHICAGO AGENCY, 217 LAKE ST.

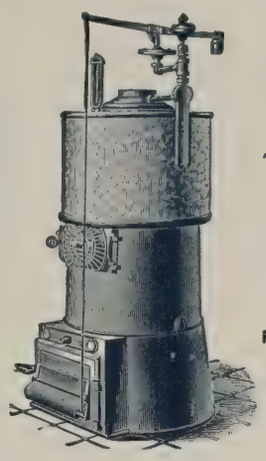
The Western Society of Engineers favored us with an invitation to an excursion to the main channel of the sanitary district of Chicago, held on Oct. 6, which we beg to acknowledge with thanks.

Kitchen Boiler Connections is the title of a book just published by David Williams, 96-102 Reade street, New York. It is made up of a selection of practical letters and articles relating to water backs and range boilers, taken from the Plumbing and Letter Box departments of the Metal Worker. The letters coming from all parts of the country and from practical men, who have written from their personal experience, constitute a most valuable source of information. The descriptions are plain, and the illustrations add all that is required to make them clear and comprehensive. These articles have been carefully edited, the book being divided into two parts, the first being on water backs and boilers and their connections, and the second on heating rooms from range boilers. The main divisions of the volume are as follows: Water Backs and Their Construction; Boiler Construction, Operation, and Connections; Circulating Pipes; Multiple Connections; Double Boilers; Difficulties Met in Every-Day Practice; Relief Pipe and Vacuum Valve; Horizontal Boilers; Miscellaneous. Heating Room from Kitchen Boiler; Radiators Heated from Coils in Stoves. Seventy-one illustrations, 8 vo., 140 pages, cloth. Price $1.

The J. W. Chamberlain Co., Bangor, Me., are selling large numbers of the Columbia ceiling plate to the steam and hot water fitters in all parts of the country. The company have made arrangements whereby these goods will be delivered freight paid to any city in the country.

Russell Wheeler & Son, Utica, N. Y., are catching the market with their nipple-connected Palace King boiler. Since placing this connection in their boiler, the sale of Palace Kings have rapidly increased. The company have lately made some large shipments to the Southwest and West, whilst the home trade has exceeded their expectations. The present plant of the company, founded in 1842, has proved to be inadequate to supply the demand, and plans have been drawn for new foundry buildings to be erected upon a plot of ground lately purchased, 350 by 1,000 feet, fronting on Park avenue, East Utica. The new premises lie between the Erie Canal and the N. Y. C. R. R., and are splendidly situated for shipping and receiving goods by either rail or water. A freight track will be run alongside of the warehouse and into the foundry yard, for either lifting or delivering material with the least possible labor. The company guarantees that a test of 85 pounds per square inch is put upon every boiler before shipment, and state that a fitter can mount their new boiler in fifteen minutes.

(*Continued on page xvi.*)

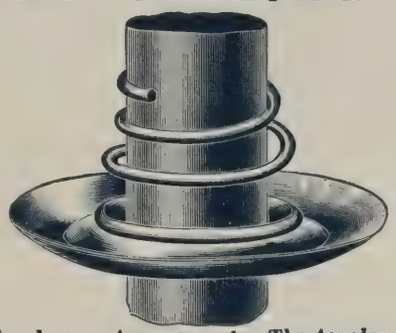


VOLUNTEER
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ALL RIGHT.
The Best and
ONLY
Self-regulating
Hot Water Heaters
on the market
FOR STEAM HEATING.
Manufactured by
The Wm. H. Page Boiler Co.,
Norwich, Conn.

"COLUMBIA"
WALL AND CEILING PLATE.

SEE

Those smaller spirals at the top?
They grip the pipe!
See those larger ones below?
They hold the plate and allow for expansion and contraction of the pipe!



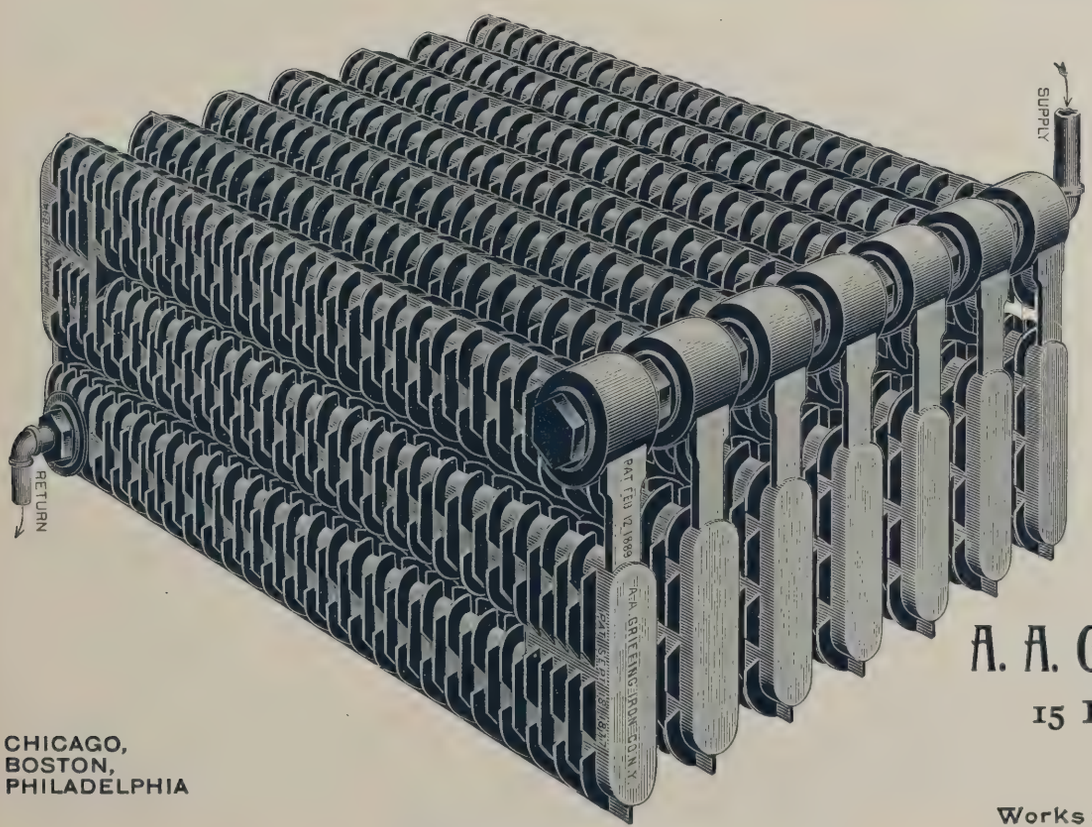
Easily adjusted and inexpensive!
Made in all sizes.
Send for circular and prices.
Sample on application.
Ask your dealer for them or send to the manufacturers.

Once in place this plate always stays there! The tension of the spring keeps it!

The J. W. Chamberlain Co., Bangor, Me.

THE BUNDY

Newport Indirect Radiator ...



HAS a depth of 16 inches, large openings, all screw thread connections, no diaphragms to impede circulation, a gradual slant from feed to return, no air or water pocket, and is specially well adapted for hot water heating : : :

CHICAGO,
BOSTON,
PHILADELPHIA

A. A. Griffing Iron Co.,
15 DEY STREET.
NEW YORK.

Works: Jersey City, N. J.

BUNDY NEWPORT INDIRECT RADIATOR.

The Walworth Construction & Supply Co., Boston, have removed from 60 Pearl to larger and commodious quarters at 100 Pearl street.

We acknowledge with thanks the "shovel and coal" souvenir presented by Stevens and Gilchrist of Wilkesbarre, Pa. We think the safety pin will come in very handy.

Kenrick Bros., Brookline, Mass., are putting in the heating apparatus in the high school building and in the residences of E. A. Hopkins and S. C. Conant in Brookline.

The Richardson & Morgan Co., 52 Beekman street, New York, show in this number of our paper their Cyclone steam boilers, the sale of which has been remarkable. They are well worth examination.

Mr. J. L. Bixby, Jr., formely heating engineer with Smith & Anthony, is now located at 16 Province street, Boston, with Wm. Lamb & Co., who represent J. L. Mott & Co., of New York. Mr. Bixby has charge of the heating department.

Isaac Coffin & Co., Boston, Mass., are putting in heating apparatus in a dwelling at Waltham, Mass., for the Sisters of Notre Dame; in the residence of John J. Munroe, at Woburn, Mass.; a residence of A. E. White Everett Mass.; Odd Fellows Block, Dorchester, Mass.; residence of Dr. E. W. Hill, Newton, Mass.; and house at East Somerville, Mass., for H. B. Serrish.

The Board of Education of Lawrenceburg, Ind., have contracted with the Peck-Williamson Heating & Ventilating Co., of Cincinnati, for a new apparatus in their school building. The two new school buildings at McKeesport, Pa., are to be equipped with the Peck-Williamson system, both heating and ventilating. This contract has lately been awarded by the board of education.

Chas. S. Redfield, treasurer of the Hohman & Maurer Mfg.Co., Brooklyn, N. Y., formerly private secretary to President Roswell Miller, of the St. Paul Railway, was recently married in San Francisco to Miss Florence Lockman, a niece of Mrs. Mark Hopkins, and one of the acknowledged belles of the coast. Mr. Redfield is a hard worker, a popular business man, and is receiving the congratulations of his many friends in the trade.

The Economy Foundry & Machine Co., Syracuse, N. Y., will manufacture the goods for the New Home Furnace Co., of Norwalk, Conn., which was recently organized to manufacture furnaces under the patents of Gen. George D. Sanford, of Albany, N. Y. With Mr. Sanford are associated Messrs. Brown & Co., of Syracuse, and George H. Raymond, of Norwalk, Conn. The headquarters of the company is at Norwalk, Conn., with Mr. Raymond as general manager.

Edward E. Parker, of Woburn, Mass., has lately secured contracts for heating by either steam or hot water the following residences: Thos. Reed, Brighton, Mass., Mrs. J. P. Converse, Chas. H. Dudley, Chas. W. Ames, David Ames and Thos. J. Callahan. With the exception of the last named, where a Gurney heater will be used, Richmond heaters will be installed in each case. Mr. Parker reports that as far as Woburn is concerned the hot-air furnace has practically gone out of date, only two hot air furnaces having been put into new houses in that city this year, and in both those cases the owners state the saving in the first cost was the cause of their selection.

The Boston Blower Co. are very busy with new work. Among some of their late contracts are the Boston City Hospital, where their system and galvanized iron connections are used; the Indiana Reform School for Boys, at Plainfield, Ind.; the new electric station at Baltimore, fans for forced draft; new Gammar School, Westboro, Maine, (hot blast throughout); new High School at Webster, Mass.; new Odd Fellows Building, Philadelphia (ventilating wheels); High School, Brookline, Mass.; U. S. Government vessel Leyden; Webster, Irving, Lincoln, Tappan and Clinton schools, Detroit, Mich. (fans and heaters); Metropolitan Traction Company, New York, three big engines and fans for the Houston street power house; U. S. steamship Maine (steam fans), and lots of other new work in New York and Brooklyn.

George B. Cobb, Jr., the young heating engineer, of Geo. B. Cobb & Co., 96 Centre street, New York, has this season developed great speed on his bicycle, having won many prizes, including medals, gold watches, diamonds, jewelry, etc., and at the closing tournament of the season in New York, Sept. 15th, he made a remarkable record for a novice, winning the highest score in all the class A races of the day, and thereby the fifty-dollar championship medal, with the title of "Champion Novice of '94," a most creditable performance, as this championship was open to all the 36 clubs forming the Metropolitan Association of Cycling Clubs of New York and New Jersey. Young Cobb's good judgment and push seems to show up as conspicuously in his races as in his business, where he is a recognized "hustler."

Mr. G. E. Fenn, the manufacturer of Fenn's patent rotary ventilator, 94 Blackstone street, Boston, has been very successful with his ventilators. They are in use in the Boston Rubber Shoe Co., the Charlestown State Prison, the New England Conservatory of Music, the Hotel Ponemah, Milford Springs, N. H., the Sears Building, Boston, and the post-office at St. Johns, N. B. These are only a few of the many buildings Mr. Fenn has received orders for, and churches, school houses, halls, etc., for which orders are being placed, can receive circulars fully describing these ventilators upon application as above. Mr. Fenn has also a newly improved revolving ventilator for preventing steam and frost on show windows, and ventilating offices without draft. This ventilator is entirely noiseless and will run a year or more without attention.



New York Office, 36 Park Place.

We Make Our Bow

to the American Society of Heating and Ventilating Engineers and say to them specify the

Dunning

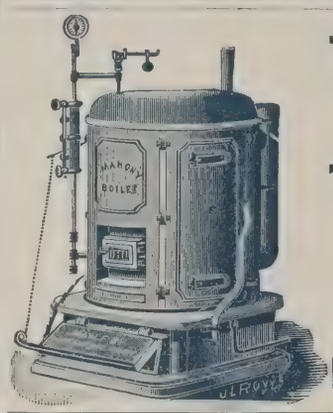
and you will make no mistake; 19,000 of our Steam and Hot Water Boilers now in use . . . . . .

Agencies in all the principal cities of the world.

Descriptive Catalogue free.

New York Central Iron Works Co.,

298 Exchange St., Geneva, N. Y.



THE MAHONY BOILERS.

For Steam or Hot Water.

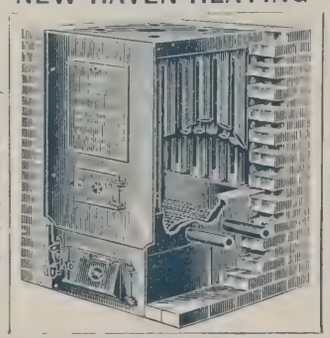
THOUSANDS IN USE,

And all Giving Satisfaction.

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NEW HAVEN HEATING AND PLUMBING CO.



NEW HAVEN, CONN.

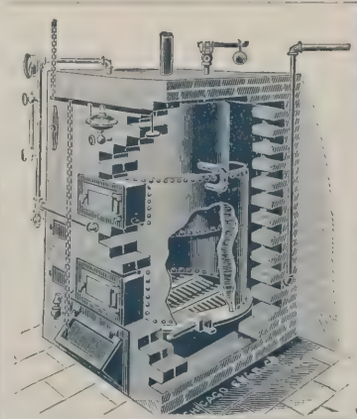
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Hot Water Heater

Selling Rapidly To the Trade Only.

Money In It For You.

Send for Catalogue, Price List and Discount.



THE IMPROVED HAXTUN BOILER

FOR STEAM AND HOT WATER HEATING.

ECONOMICAL. *No Tubes to Clog Up.*

Magazine with Front Feed—can use HARD OR SOFT COAL.

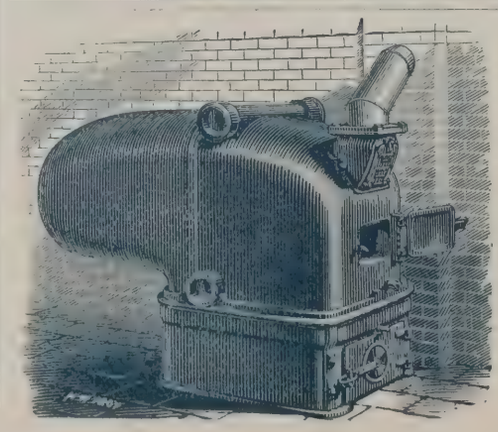
BEEN IN SUCCESSFUL USE 18 YEARS.

MADE BY

KEWANEE BOILER CO., KEWANEE, ILL.

Chicago Office. Cor. Dearborn and Lake Streets.

Send for "Haxtun" Catalogue No. 2.



HITCHINGS & CO.,

233 Mercer Street, New York.

ESTABLISHED 1844.

Hot Water Heating Apparatus

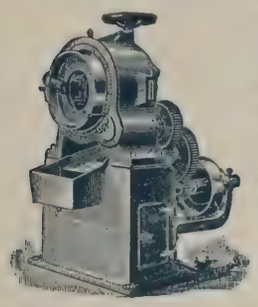
for Greenhouses Conservatories, and Dwellings.

ALSO

WATER HEATERS FOR BATHS.

5 Styles of Boilers, 24 Sizes.

Send 3 cents postage for catalogue.



If You Are a Democrat, Republican, Populist, Prohibitionist

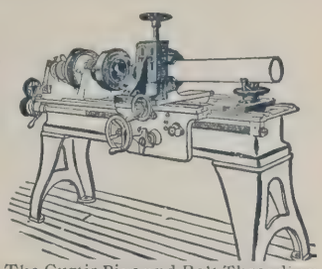
We can interest you if you are in the market for a pipe cutting or threading machine. These machines have been on the market for a number of years, and their reputation is established. The fact that our sales are constantly increasing, and in a number of cases duplicate orders from parties we have sold to before, shows the machines will do all we claim for them.

SEND FOR CATALOGUE. We make

Forbes' Patent Die Stock, Pipe Cutting and Threading Machine for Hand or Power. Also Pipe and Bolt Threading Lathe Attachment.

CURTIS & CURTIS, 46 Garden Street, Bridgeport, Conn.

Portable Hand Machines we make enable one man to cut and thread 8-inch pipe.



The Curtis Pipe and Bolt Threading Attachment for Lathes.

Col. W. C. Mowry, of Norwich, Conn., manufacturer of the Page steam and hot water boilers, is the candidate for Secretary of State on the Republican ticket.

The Pickering Block, at Portsmouth, N. H., is being heated by Willard E. Paul, of that city, using a car-load of Exeter radiators. The same make of radiators are also going into the Rockingham National Bank of that city.

Levi Hey & Co., 311 and 313 State street, Rochester, N. Y., send us what is called the Rochester Directory of Ranges, manufactured by Fuller & Warren Co. The list is a very large one and shows the continued popularity of these goods.

McRae & Roberts Co. have filed articles of association at Detroit, Mich., for the organization of a company for manufacturing steam brass goods and steam supplies. The capital stock is $125,000, one-half of which is said to have been actually paid in.

Geo. T. Barnes, Newburgh, N. Y., has sent us his latest work showing several cuts of houses heated by the Richmond steam and hot water heaters; also testimonials and a complete catalogue of Richmond steam and hot water heaters, all in one. He will be glad to send it to any fitter who should desire it.

A Little Light on a New Idea comes to us from Schill Brothers, of Crestline, Ohio. It is one of the neatest little books we have seen for some time, being illustrated with initial letters, and really new ideas on each page, which causes one to read the book clear through before stopping. If you want to be entertained and receive a most novel little souvenir, send for one. They are free.

The Fuller & Warren Co., of Troy, N. Y., send us their supplementary catalogue, especially describing their twin system of heaters, which is well adapted for large buildings. In mild weather one boiler can be run independently when furnishing sufficient radiation, thereby economizing largely in coal and avoiding overheated rooms. The new boilers shown in this supplementary catalogue, together with their system of branched circulation, gives the company one of the largest and most complete outfits among manufacturers of hot water apparatus.

The United States Heater Co., Detroit, Mich., never allow their friends the fitters to forget them, and are constatly keeping before them printed matter that is useful as well as ornamental. Their latest is a catalogue of their hot water and steam heaters, including the new designs in the sizes out this year, with an illustration of the different specialties manufactured by them. Most complete instructions as to setting up of the 300 series of Capitol and Hecla heaters are given, and some other important information regarding the figuring of radiation, greenhouse heating, etc., follows. The catalogue will be sent upon application without charge.

The Van Auken Steam Specialty Co., 201-207 S. Canal street, Chicago, inform us that the Municipal Building at Hamburg, Germany, which we illustrated in our August number, is equipped with perfect Duplex automatic steam air valves, they receiving the order through their German representative. They are also equipping the new Planters' Hotel at St. Louis, Mo., with the same valve, 840 of them being used. The new Union Depot at St. Louis is also using 460. The company further states that they can report a very satisfactory trade on air valves, steam traps, and radiator shields. They find business much better than they had anticipated for the dull season which we have passed through.

The Raymond & Campbell Mfg. Co., of Middletown, Pa, have issued a most magnificent catalogue of their stoves, ranges, heaters, etc. A full-page illustration of their plant, which is in the heart of the iron and coal region, shows that their works are not only extensive, but that they have the best of railroad facilities. The catalogue is unique, being printed on tinted paper, with a white border, and will attract much attention, not only from this fact, but from the fact that a most complete line of the different goods manufactured by the company is shown, illustrated with cuts which present the points of superiority most fully. The company are the manufacturers of the well-known Conqueror furnace as well as of registers and many cooking utensils. The company give, under Repairs, a very complete item, so that there may be no trouble to the fitter in ordering the number. They have also a first-class repair shop, fitted up with the latest of machinery for manufacturing steam engines, boilers, shafting, hangers, and pulleys, double and single acting pumps, etc. This being a catalogue more particularly devoted to stoves and ranges, it is not until the last pages that we find the Lindemuth Sun steam and hot water heaters illustrated, as they issue another catalogue especially on this line of their manufacture. Enough testimonials on their boilers are printed to show that they are having a large sale, and the company will be glad to send this catalogue to all dealers metioning HEATING AND VENTILATION.

(*Continued on page xviii.*)



The Scollay Hot Water Heater

For Warming DWELLINGS, STORES, OFFICES, CHURCHES, PUBLIC BUILDINGS, &c

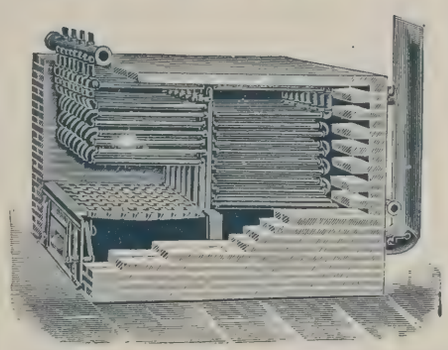
Also Boilers specially constructed for Greenhouses, Conservatories, Baths, Laundries, &c. . . . . .

Send for Illustrated Catalogue and Price List.

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For Steam and Hot Water Heating

And for Steam Power.

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Most Reliable and Efficient

It is the only regulator which is guaranteed to change direction on a variation of one pound steam pressure.

IT WILL CONTROL ANY DAMPER.

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29 to 33 Haverhill St., Boston.

New York Office: 109 Liberty St.

Chicago Office: 218 Lake St.

W. D. Parlin, of Natick, Mass., is heating the Wellesley College, Wellesley, Mass., using Exeter ornamental radiators. H. W. Hubbard, of Keene, N. H., is steam heating the new school house at Troy, N. H., using Exeter radiators.

The Manufacturers' Advertising Bureau and Press Agency, 111 Liberty street, New York, send us their little book entitled Advertising for Profit. This is one of the few advertising agencies in this country that are reliable and straightforward in all their dealings, and Mr. Benj. P. Western is to be congratulated upon the class of clients he is doing business for.

The Hancock Equipment Co. have lately opened offices at 41 Federal street, Boston, Mass. F. B. Wetherbee, Chas. A. Cotton and Alfred S. Kellogg, formerly with the Davidson Ventilating Fan Co., are the incorporators. They have already secured the New England agency for the Woodbury automatic high speed engine, and the steam boilers manufactured by the Stearns Mfg. Co. of Erie. They are also representing the Short-Conrad Co.

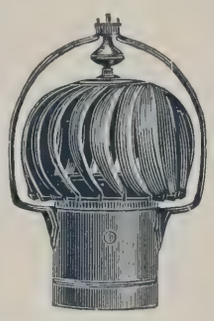
One of the handsomest catalogues we have received this year is that sent out by the Smith & Winchester Co. of Boston, on their new Winchester boiler. The cover is a very attractive design, in the center being a wreath tied with ribbons in which the name, "The Winchester," appears. The first page has a small cut representing an open valve, out of which issues a cloud of steam in which the name of the boiler appears. After that follows the general matter, which is printed in a very pretty type in both red and black letters. Very neat initial letters are used, and the cuts of the boilers attract by their design, which is very much out of the ordnary in the way of fancy decorations, which improve the looks very much. The Winchester steam and hot water boilers in portable and brick set form are shown, also the Winchester anti-clinker rocking and dumping grate. A general description of them all are given. The points claimed by the company as to durability, safety, cleaning, the grate, clinker door, check damper, trimmings, firing tools, etc., are very clearly enumerated. Tables, sizes, dimensions, and prices follow, with a very complete telegraphic code. A beautiful monogram on the outside back cover completes this handsome work, which should be in the hands of every fitter, and can be had upon application without charge.

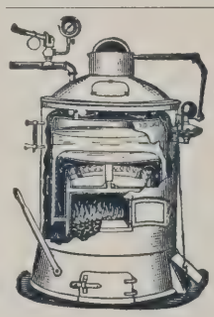
The Union Leasing & Mining Co., of Leadville, Col., on July 28th, dictated the following letter as their experience with Magnesia coverings, unknown, until some time afterwards, to the agents of the Keasbey & Mattison Co., who manufacture the Magnesia sectional coverings: "Your favor, with the inquiry received, and I will be pleased to give you the desired information. We came to use the Magnesia plastic on trial by reading of successful experiments with it on the ocean steamers. We carry steam in an 8-inch line from our boilers down a wet shaft, 800 feet, there using it to run a big compound duplex pump, with which we are pumping 1,100 gallons per minute, and the guage at the boilers varies less than one-half pound from the guage at the pump station, almost 900 feet away. We have six 80 horse-power boilers; all fittings, domes, valves, and in fact all pipe connections are covered. The magnesia comes in two different forms; it is moulded to fit any pipe, with a canvas covering, also moulded in two pieces to fit all kinds and sizes of valves; then it comes dry (loose) in bags for the surface steam lines. For instance, on a line from one shaft to another we use it dry. In the shaft where it is wet, we put the moulded form on the line, then cover it about with tin or galvanized iron. For the domes of the boilers, we get it moulded in blocks and then take the dry, mix it as you would mortar, tie the blocks on with small copper wire, and then plaster over with the mortar. Upon covering our surface lines (and we have one line extending from the El Paso shaft to the Bancock, a distance of 2,400 feet), we found the guage at the Bancock varies about one pound from that of the El Paso shaft, the steam being made at the El Paso shaft. In this line we use 4-inch pipe about half way, then it is reduced to 2-inch. The way we used the magnesia on this line was to build a rough wooden box or trough, with the top about one-half an inch larger than the steam line; then laid the line in this, packed loose dry magnesia around it, and nailed the cover on. If you put 1-inch of magnesia around your pipe I will guarantee from personal experience, that in cold weather you will find ice all over your line. I have seen icicles three feet long on ours in winter and 100 pounds steam only 1 inch away. In this line, however, we have a steam trap, which adds greatly in the way of dry steam. The trap sets in the center of the line, about 1,200 feet from either end, and then each end descends until it reaches the trap. In regard to the question you ask about the size of steam line, etc., I prefer not to pass an opinion. However, I am satisfied that you can find no covering for pipe as good a non-conductor of heat as the above-described magnesia. If you use this and a steam trap, if necessary, you will have dry steam with very little or no loss. Messrs. C. W. Badgley & Co., Denver, are the General Agents for the covering and you can get it of no one else in Colorado. They will be glad to answer your inquiry and mail you circulars, price lists, etc.

(Signed) N. M. Estey, Ass't Gen. Mgr.

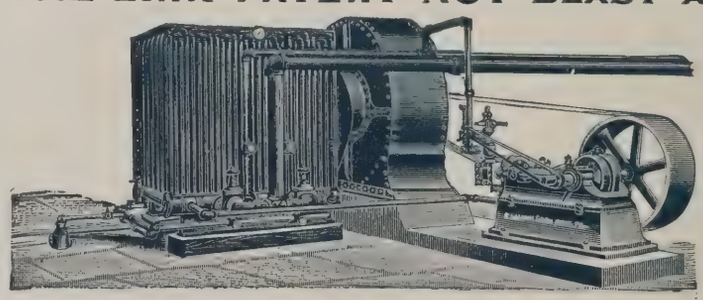
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PATTERNS,
HOT WATER AND STEAM BOILERS,
Originated and perfected at moderate cost of work with no bonus for invention at
VEDDER PATTERN WORKS,
H. CLAY BASCOM, Prop. TROY, N. Y.

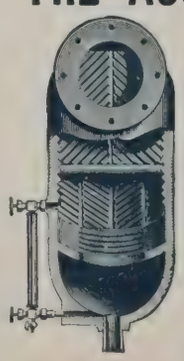
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FOR FACTORIES, CHURCHES, HALLS, SCHOOLS, Etc.
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Steam and Hot Water House Heater.
The Simplest, Cheapest and Best.
A testimonial:
PHILADELPHIA, PA.
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Our heaters are made of the very best material, by skilled workmen, and each heater section is tested, to 120 pounds steam pressure before leaving the factory. Correspondence solicited.
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(PATENTED)
FOR
PURIFYING EXHAUST AND ELIMINATING CONDENSATION
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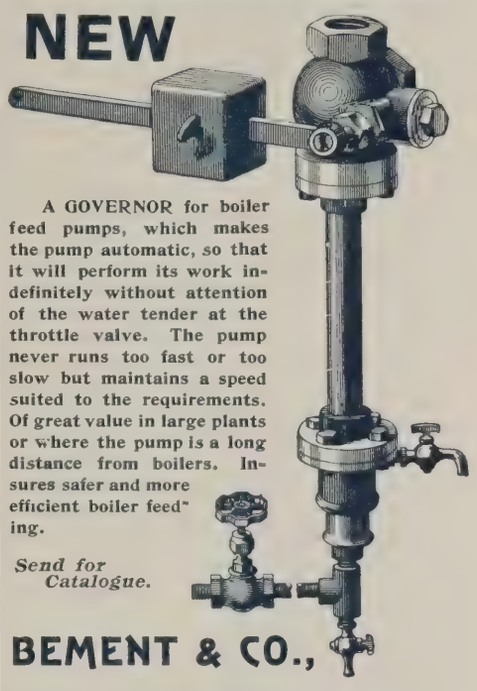
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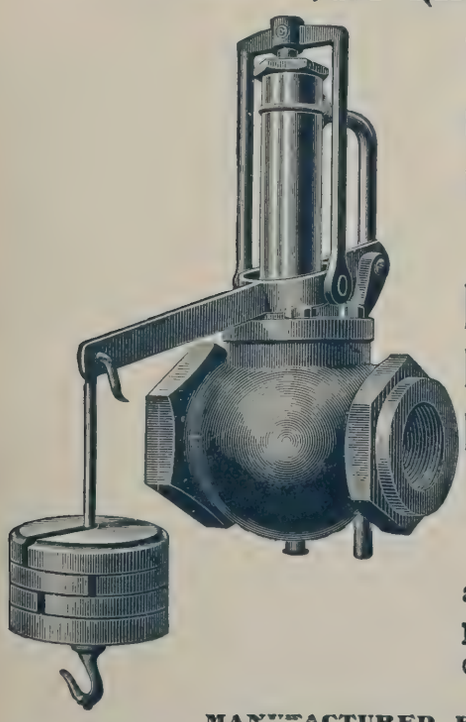


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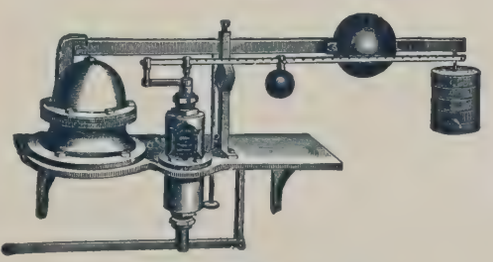
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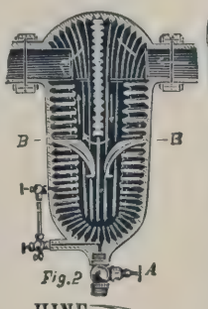
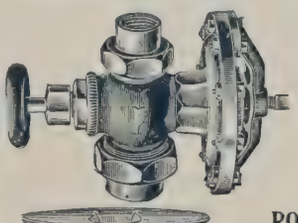


Fig. 2

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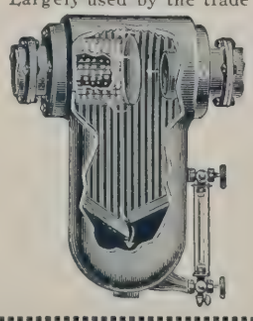


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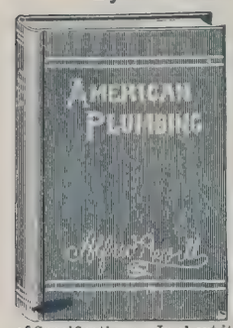
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WILKS HOT WATER HEATERS

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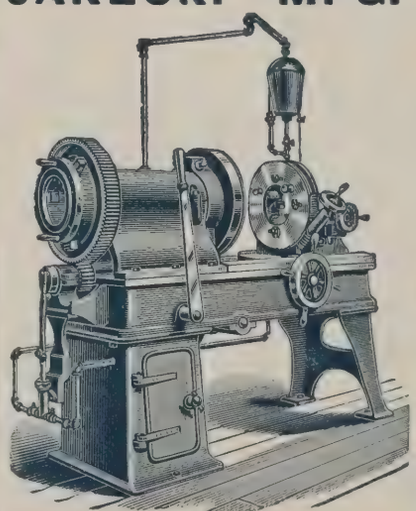
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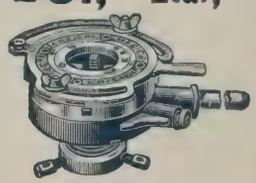
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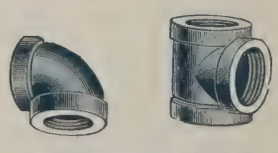
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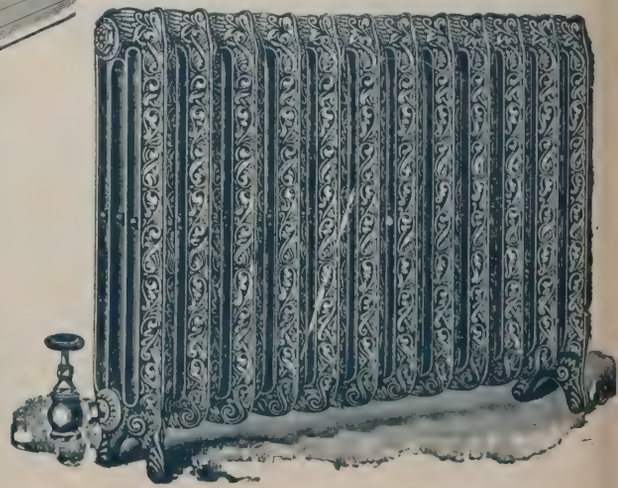
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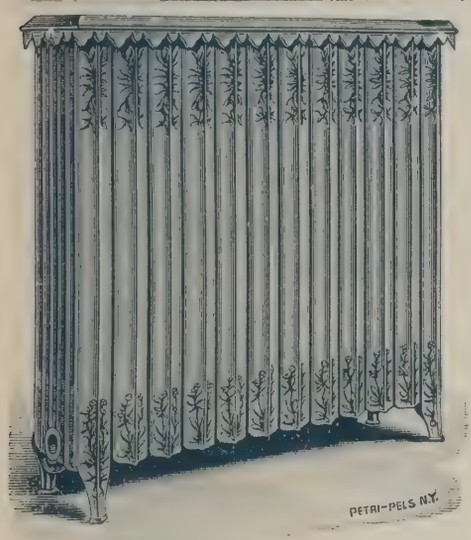
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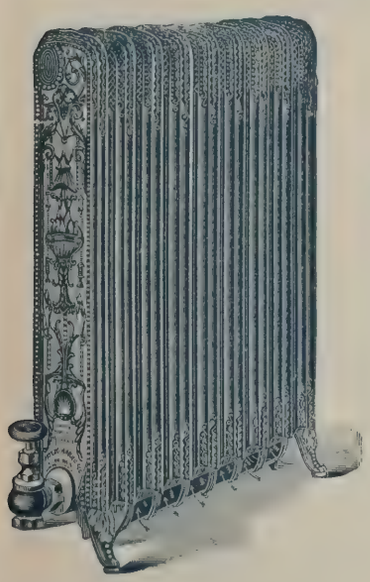
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THERMOSTAT

for STEAM HEATERS and HOT AIR FURNACES



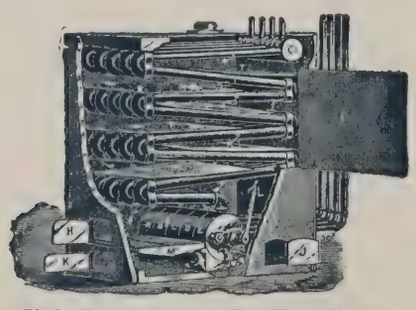
will absolutely control the draft and pressure of steam from the temperature of the room.

We regulate the pressure according to the amount of heat desired without any changing of weights for mild or extreme cold weather, can open and close your dampers at variation of ¼ pound pressure, and open and close the dampers at variation of one degree of temperature—a thing that no other regulator made can do. It is **Strong, Durable, Simple, Perfect, Efficient and cheap.**

Write for Prices and Discount.

Beers Bros. Electrical Supply Co

506 W. Water St., Elmira, N. Y.



Little Wonder Sectional Hot Water Heater,

LIKE the McLellan Sectional Safety Steam Boiler, advertised in May number of HEATING & VENTILATION, is a sectional pipe heater and covered by the same patent; is the most economical heater in fuel on earth; has draft or baffle plates which cause the heat gases to travel in a zig-zag course to chimney. Thus the water absorbs a greater amount of heat than in any other heater, in fact smoke pipe is always nearly cold. Burns No. 2 chestnut coal and all other kinds of fuel; has shaking and dumping grate. Send for description and price list. Will sell State Rights or take a partner with means to increase the business.

C. T. McLELLAN, PATENTEE AND BUILDER,

V. M. C. 1105 **EASTON, PA.**

PLAIN SOLID FACTS

Some Makers of Air Valves

"TALK BIG"

But sometimes their Valves



DON'T "Back Up Their Talk."

Which goes to prove that TALK don't always hold a customer, but it is the work the Valve does.

The Eureka

don't have to have a traveling salesman. The **FREE SAMPLE VALVE** we send to any Steam Fitter who writes for one is our best salesman. Send for a sample **EUREKA**, and prove for yourself that our claim is good. "You'll do just the same as all our customers do," **STAY RIGHT WITH US.** The **EUREKA** works on either Steam or Hot Water. No. 5 is made with side inlet for radiators. No. 4 is made with bottom inlet for indirect and coils.

SEND FOR SAMPLE VALVE, CIRCULAR, PRICES AND DISCOUNTS.

HODGE BROS.,

15 CHARDON ST., BOSTON, MASS.

It's All Right

A New Departure in Steam Radiator Valves

Quick Opening AND Inter-Locking,

It saves from 15 to 25 movements.

To CLOSE.—Push down and turn to right.
To OPEN.—Turn to left and pull up.



SEND FOR PRICE LIST AND SAMPLE.

THE . .

DETROIT LUBRICATOR CO.

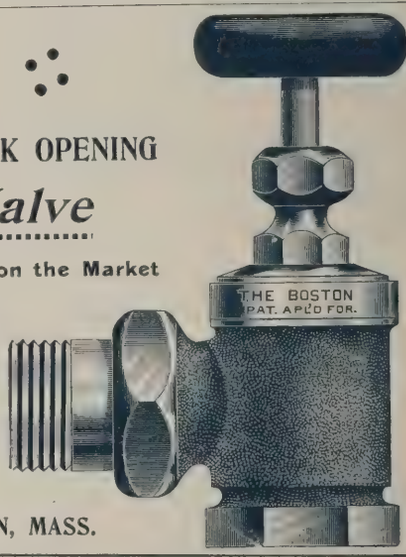
NEW YORK OFFICE, 89 CENTRE ST.
W. A. RUSSELL, Sales Agent.
Detroit, Mich

Don't do anything Until you see

THE NEW, QUICK OPENING

Boston Radiator Valve

The Cheapest and Best Quick Opening Valve on the Market



Unlike other valves, it has a stop at the top, which prevents springing, and it has a whole cylindrical plug, so constructed as to make proper allowance for any expansion or friction, lasts longer, wears better, is very ornamental. Liberal discount to the trade.

SEND FOR ILLUSTRATED CIRCULARS

Messenger Valve Co.

19 DOANE STREET, BOSTON, MASS.

"CHICAGO"

QUICK-OPENING

Hot Water Union Radiator VALVE.

The accompanying cut represents our new Hot Water Radiator Valve, which we call the **"CHICAGO."**

An examination of it will convince the practical steam-fitter that this is THE valve for hot water. It has all the merits of self-packing, so the stuffing box can be packed at any time without shutting off the water. The body is heavy, symmetrical and of the best steam metal, so no danger of twisting to pieces while connecting it.

The Disc is cast brass and of good weight, with by-pass that assures perfect circulation, and the style—well, the style is to valves what Apollo was to mankind—and best of all, with all its style, worth and beauty.

It can be sold at about the same price of an ordinary valve.

We Plate these in Antique Copper to correspond with the newest architectural finish, and at no extra cost above the nickel.

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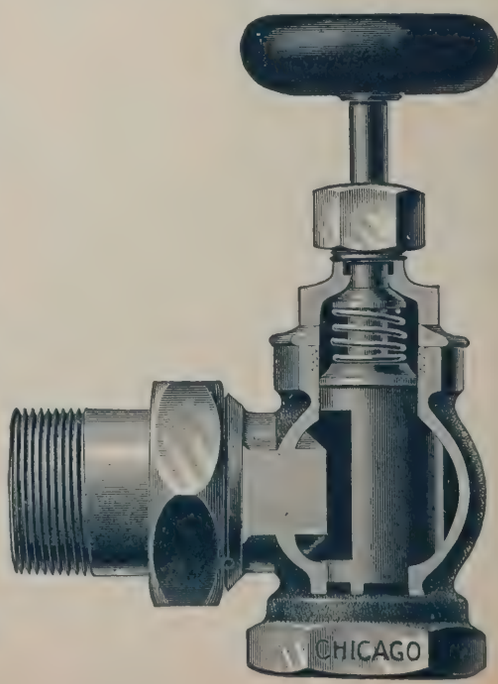
49 Jefferson Avenue, Detroit, Mich.

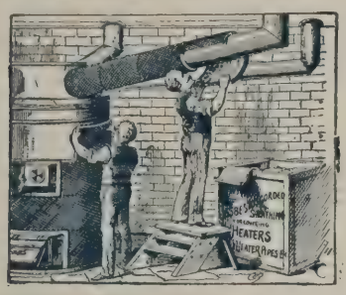
SCOTT VALVE CO., Western Agents,

32 N. CANAL ST., CHICAGO, ILL.

"CHICAGO."

Hot Water Union Quick Opening Radiator VALVE.

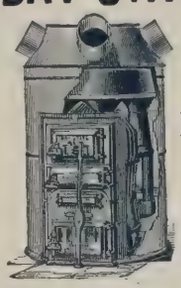




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ASBESTOS
FIRE-PROOF, NON-CONDUCTING
COVERINGS.
FOR STEAM AND HOT AIR FURNACES, PIPES, ETC.
33 PER CENT. OF FUEL SAVED.
DESCRIPTIVE PRICE LIST, FREE BY MAIL.
H. W. JOHNS MANUFACTURING CO.,
ASBESTOS ROOFING, BUILDING FELT, ETC.
SECTIONAL PIPE & BOILER COVERINGS, STEAM PACKINGS, ETC.
LIQUID PAINTS, FIRE-PROOF PAINTS, COATINGS, ETC.
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CHICAGO. PHILADELPHIA. BOSTON

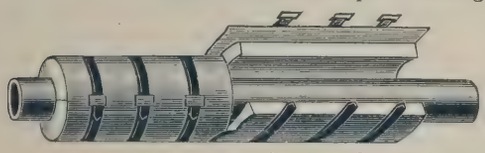


THE CELEBRATED
BAY STATE FURNACES



POWERFUL,
DURABLE,
ECONOMICAL.
Barstow Stove Company,
MANUFACTURERS,
Beekman & Water Sts., New York.
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ESTABLISHED 1836.
Prices, Catalogues, and our interesting publication, "Fireside," mailed on application.

NO. 2. THAT'S US.
See Article on Pipe Covering, Page 7, September issue.



20 per cent better than
Magnesia or Asbestos Sponge
and at prices to meet the times.

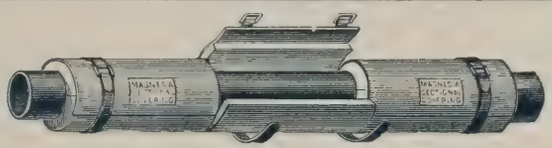
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For Heating and Ventilating
Price 50 cents, postpaid.
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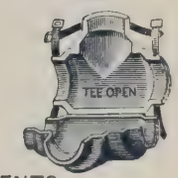


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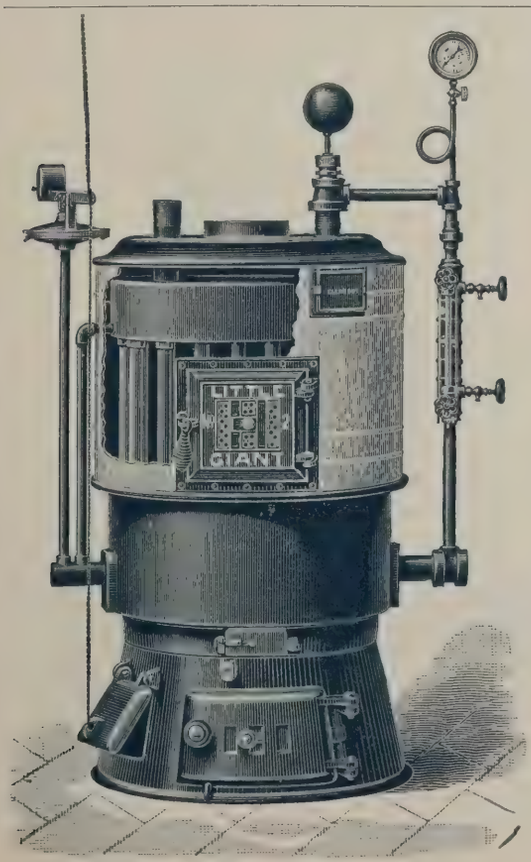
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LITTLE GIANT STEAM BOILER.

Not Requiring

A fortune to buy or operate.

Better Results

Can be obtained from no other boiler made.

Monopoly

Of Steam Heating can be maintained by using this boiler.

Write for Catalogue, Prices and Discounts.

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In a Month or So The Snow will Blow

And what will the Robin do Then, Poor Thing?

If he's a real wise old bird he'll never allow himself to be caught within several hundred miles of this vicinity, but with his mate and promising brood he will hie to the south'ard and the vale of eternal bloom. This is HIS advantage over US, at least most of us; for even if we have "money to burn" we all cannot "winter in the tropics."

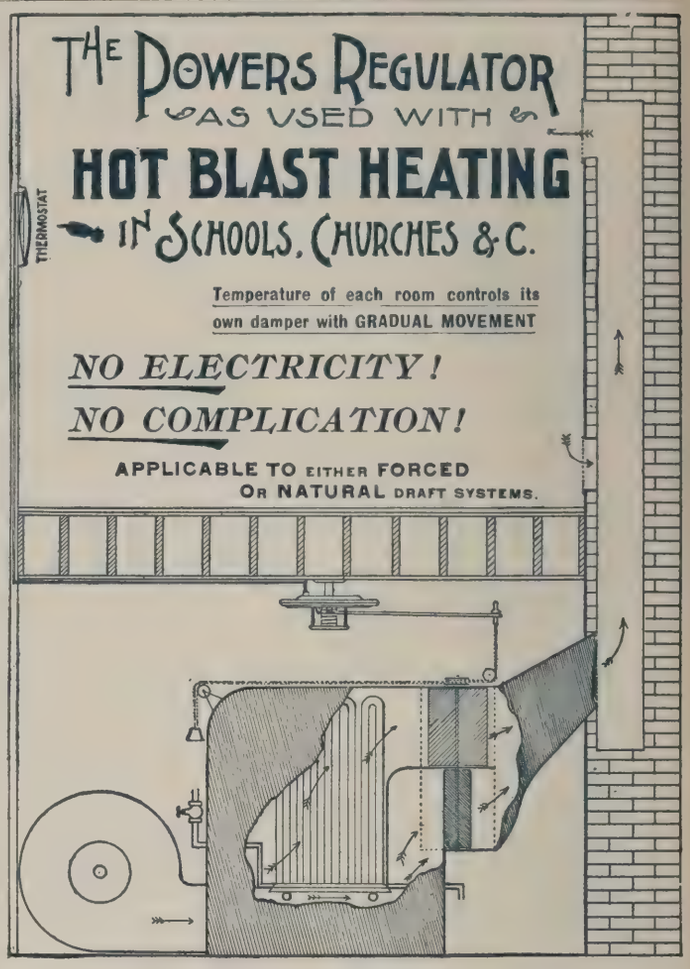
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The old folks, the loving wife and prattling youngsters should not be forgotten, and a cold hearth is a cheerless home.

Tell us your wants. We make everything and have had an experience of fifty odd years to draw upon.

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THE POWERS REGULATOR
AS USED WITH
HOT BLAST HEATING
IN SCHOOLS, CHURCHES & C.



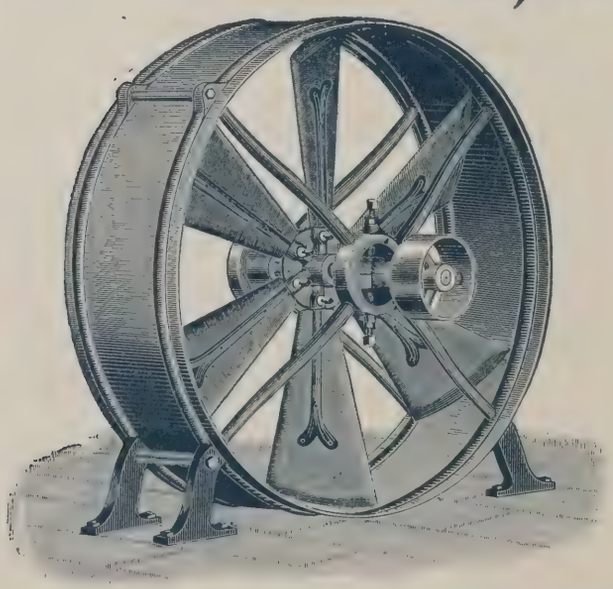
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NO ELECTRICITY!
NO COMPLICATION!

APPLICABLE TO EITHER FORCED OR NATURAL DRAFT SYSTEMS.

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36 Dearborn St., CHICAGO, ILL.
A. A. GRIFFING IRON CO., JERSEY CITY, N. J., GEN. EASTERN AND SOUTHERN AGENTS.

VENTILATING AND EXHAUST FANS.



We will wager $1,000 with any Fan Manufacturer that there is not another make of fan in the United States to-day that will give more air with less power than required by our make of fan of the same size.

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STEEL BLADES AND PATENTED.

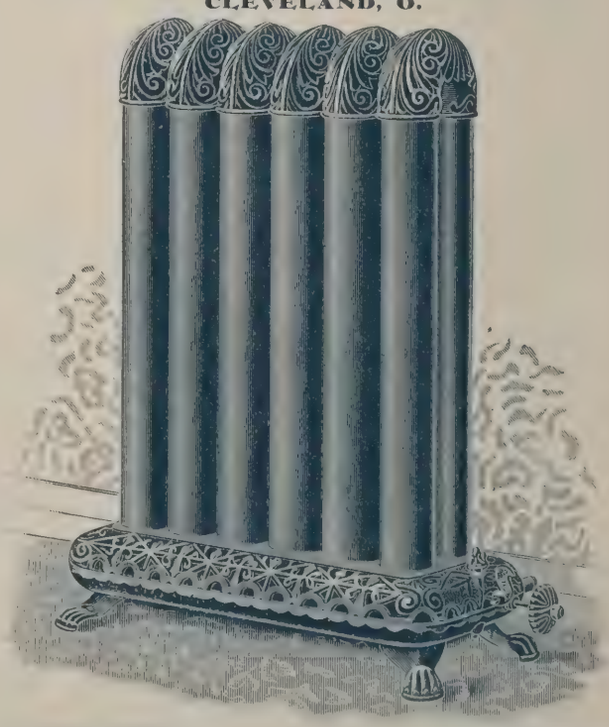
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THE Largest and most Complete line of Radiators and Heaters in the Market. For Quality, Style and Price are unequalled - - - -

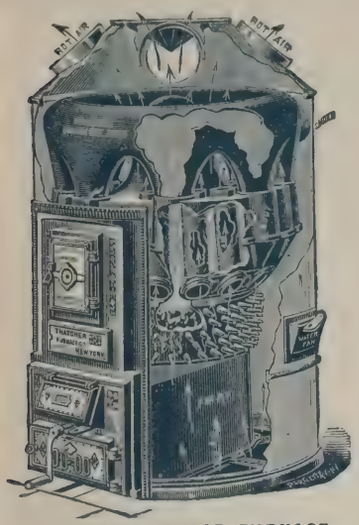
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THATCHER TUBULAR FURNACE.

: : ESTABLISHED 1850 : :

The Thatcher Furnace Co.,

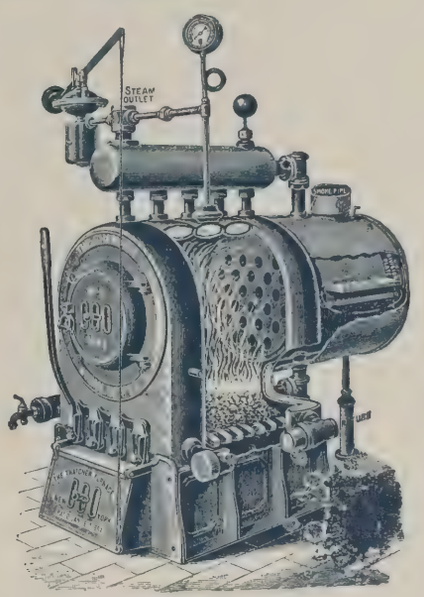
240 Water Street, New York.

Manufacturers of the Celebrated

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: : : ALSO : : :

Champion Steam and Hot Water Heaters.



CHAMPION HEATER.

NOTWITHSTANDING the hard times the demand for these goods is steadily increasing. It proves the dealers want first-class goods at fair prices. . . . . .

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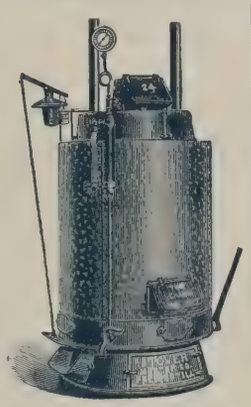
STOVER HEATER CO.

THE CUBA

Formerly called the Wilson

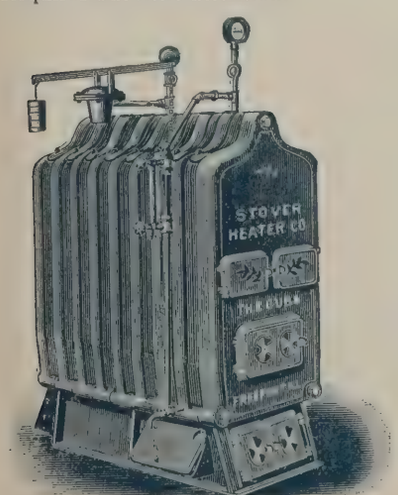
Low Pressure Steam & Hot Water Heater,

SIMPLE, ECONOMICAL,
DURABLE, SAFE
and EFFECTIVE.



Direct and Indirect Draft, Self Regulating. Self Feeding. Superior because of Large Heating Surface.

Easily transported. No door too small to admit it. All parts readily duplicated. Perfect combustion. No gas, no waste of fuel. Requires but little attention.



OTHERS LIKE IT, SO WILL YOU.

Cheapest, because Best.

Write for Prices, Capacities and new Catalogue.

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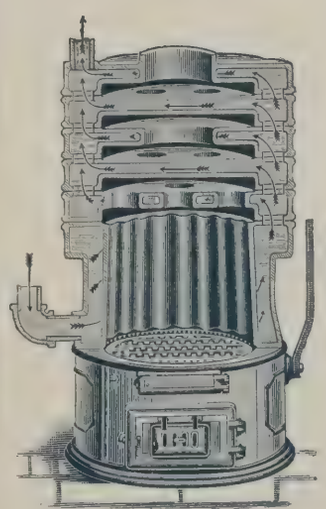
Sole Manufacturers.

Main Office and Works,
FREEPORT, ILL.

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HOT WATER HEATER.



Horizontal Sectional View.

Maximum Circulation.

Minimum Friction.

Waterways Large.

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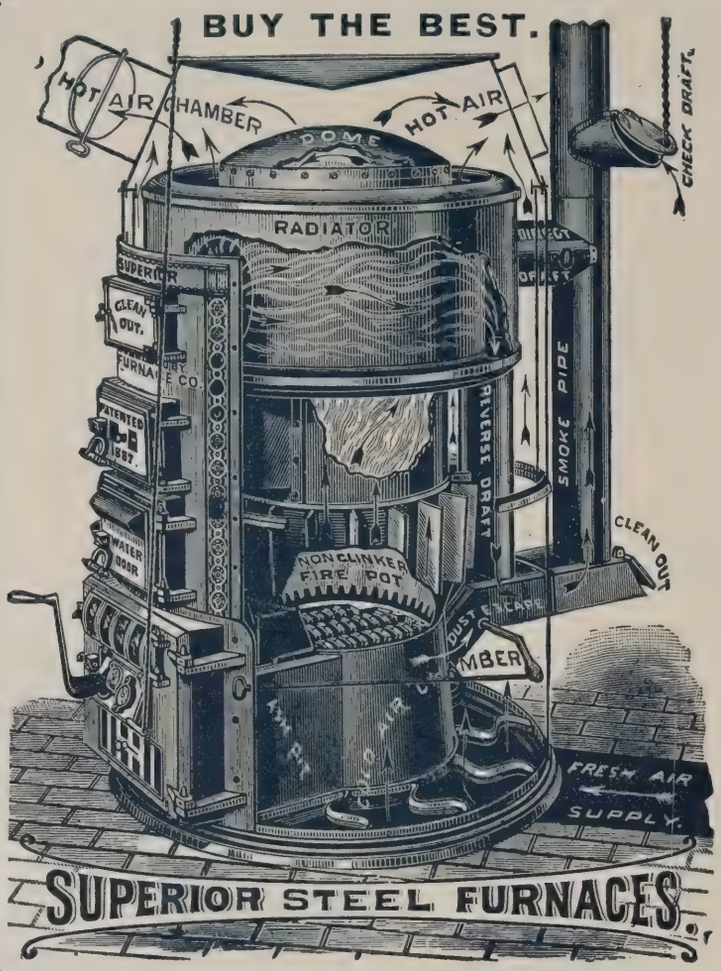
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"SUPERIOR" STEEL FURNACES

Are built upon scientific principles, after years of experience, by skilled Mechanics. Only the best materials are used in their construction. Every Furnace shipped fully guaranteed to give satisfaction. Fitted with

Smyth's Duplex Grates,
Large Combustion Dome,
Immense Radiating Surfaces,
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Direct Dust Escape,
Powerful Heaters,
Economical in Fuel,
Absolutely Free from Dust, Gas or Smoke.

FIRST CLASS IN EVERY WAY.

Send for New Descriptive Catalogue.

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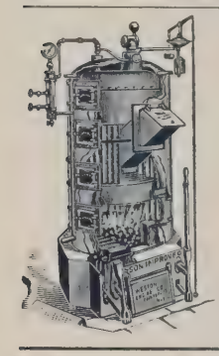
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BURROW, STEWART & MILNE,

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Exclusive Manufacturers for Canada.



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FOR STEAM OR HOT WATER.

Portable or Brick Set. 54 Styles and Sizes.

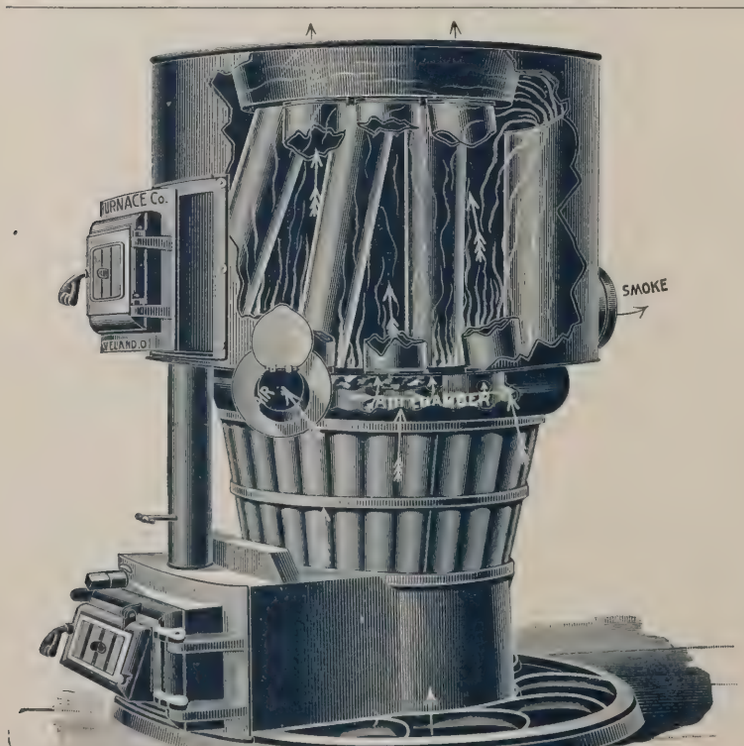
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There are many Furnaces on the market. Perhaps you are selling . . . . . .

THE BEST,

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You certainly cannot be sure of this until you have our catalogues and prices. . . . . .

The Fox Furnace Co.,

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WALWORTH MANUFACTURING CO.,

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WORKS AT
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NEW YORK OFFICE,
No. 56 BEEKMAN STREET

MANUFACTURERS OF

Materials and Tools for Steam Fitters.

Walworth Solid Die Plates.

STILLSON AND ASHLEY PIPE WRENCHES. PIPE TAPS, REAMERS.
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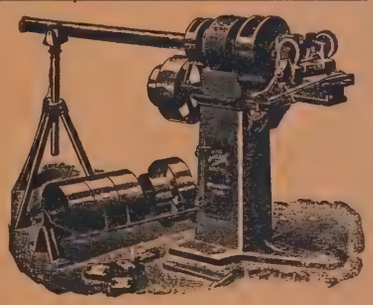
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Pipe Threading and Cutting-off Machines.

STOCKS, DIES, AND OTHER TOOLS,

for Water, Steam, and Gas Fitters.



Catalogue to those interested. Send for it.

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No Disagreeable Odor. No Ashes. Light and Heat in Abundance.

No. 327. No. 3 Lift Burner.

Height, 32½ inches. Spread of Base, 12½ inches. Nickel Finish.

THE MILLER OIL HEATERS

Just the thing for All Time and Every Day Use. For Spring, Summer, Autumn and Winter.

They are an Assured Success, from the fact that the lamps used are "The Miller Lamps," **THE LATEST AND BEST.**

IN THESE HEATERS YOU HAVE A HAPPY COMBINATION:

The Best Light. The Best Parlor Heater. The Best Cook Stove.



READY TO LIGHT, WITHOUT REMOVING CHIMNEY.

They are Clean and Odorless. Require no more care than an ordinary lamp. Cylinders of Russia Iron, with Removable Nickel Tops, or with Combination Heating Drum and Grate for Cooking. The No. 3 BURNERS have a **FLAME OF 15 SOLID INCHES.** "MILLER" HEATERS have outside **SCREW ADJUSTMENT** for regulating the wick and **PLUNGE MOVEMENT FOR EXTINGUISHING;** each one is supplied with an extra Flame Spreader so that the Lamp can be used for **ILLUMINATING** when not wanted as a Heater. All of the Best Material and Workmanship.

They will heat a large room perfectly. A tea kettle of water heated in a few minutes by removing canopy.

Perfectly Safe. They Cannot Explode. Oil Never Gets Hot in the "Miller" Heater. A Good Companion for a Cosy Nook. A Comfort for a Chilly Morning.

A MOST IMPORTANT FEATURE.

All the weight of the Cylinder rests solidly on the **FOUNT** and not on the **BURNER** in these Heaters.

In **IMITATIONS** of these Heaters the Cylinder is supported on the **BURNER**, a **CHEAP** and **WEAK CONTRIVANCE**, which makes it necessary to **REMOVE THE CYLINDER** for lighting, and which renders it impossible, or very dangerous, to use the Heater for Cooking purposes.

Send for Circular Showing Heaters with Ovens for Cooking. We Have 12 Varieties.

These Lamps hold One Gallon of Oil. Will Burn 12 hours. Easily Lighted by Lifting Top of Burner.

MANUFACTURED BY

EDWARD MILLER & CO., MERIDEN, CONN., UNITED STATES OF AMERICA.

NEW YORK STORE: 10 and 12 College Place and 66 Park Place. BOSTON STORE: 63 Pearl Street. CHICAGO STORE: Rooms 808 and 809 Masonic Temple.



No. 328. No. 3 Lift Burner.

Height, 32 inches. Spread of Feet, 11¾ inches. Russia Iron with Nickel Lamp and Trimmings.

The Winning Ticket.

CYCLONE

Read our List of Candidates.

Furnaces, Steam Boilers, Combination Heaters, Ranges.

All Honest Goods

That will stand the test of even a Lexow Investigation.

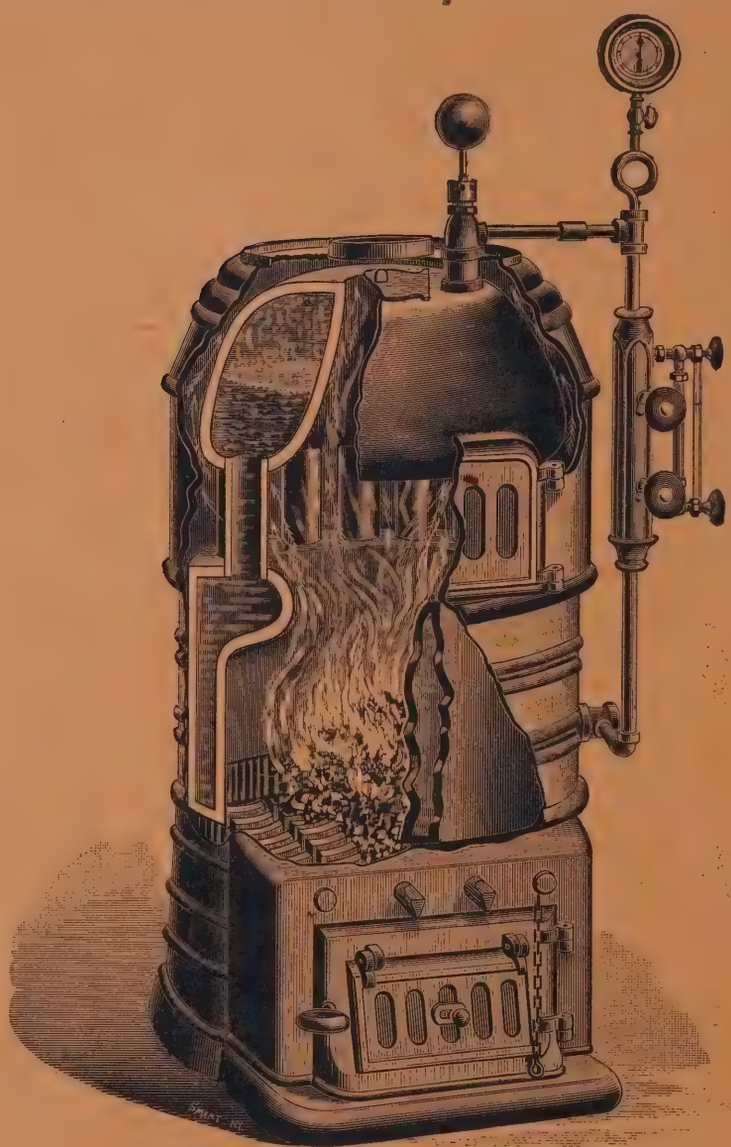
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Cyclone Furnaces.

Many styles and sizes, from 15 to 31-inch fire pots with heavy wrought steel, patented, all cast iron radiators, and triangular revolving or draw center grates. An unequalled line.

The New Cyclone Combination Hot Water and Hot Air Heating Furnaces.

These goods are the product of years of careful effort, embodying all the latest and best improvements.



CYCLONE STEAM HEATING BOILER.
The most compact and powerful steam generator in the world.

Don't Fail to Examine

Our Puritan Ranges

now made with either side or back water-backs; also with heating attachment if desired.

Also the New* PILGRIM *Hot Water and Hot Air Heating and Cooking Ranges.

AND

The New Cyclone Single Oven Ranges,

The New Reliable Ranges,

AND

The New TORNADO

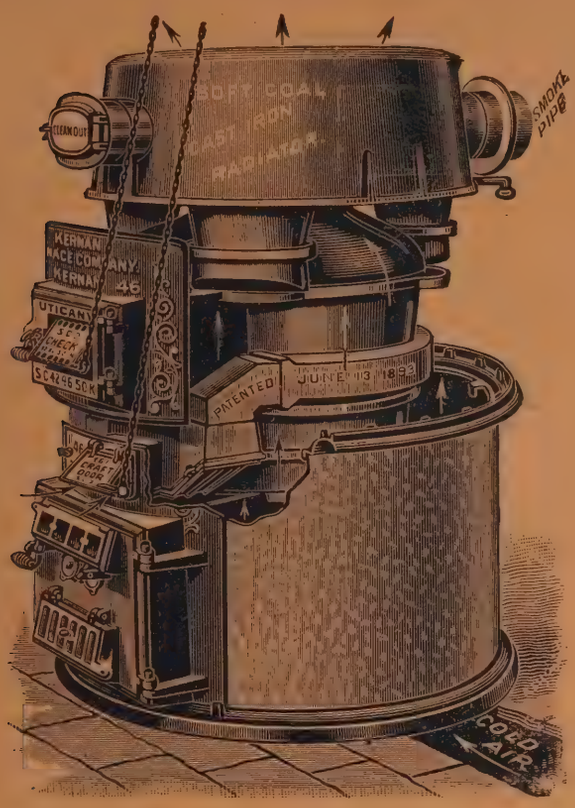
FURNACES, with Patented Wrought Steel Tubular Radiators and full revertible flues.

Send for our Prices before purchasing.

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New Catalogue Free.

92 Beekman Street, New York.



KERNAN Smoke Consumer.

No Soot. :: :: ::
No Dense Black Smoke.

Tried and Tested.
No Experiment.

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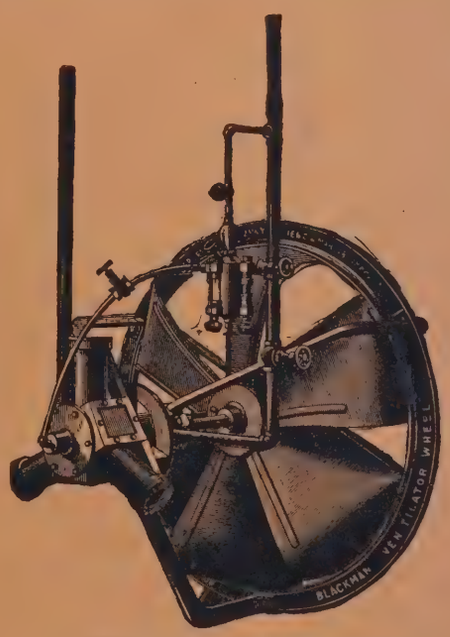
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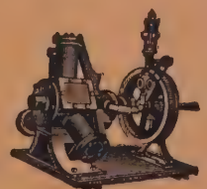
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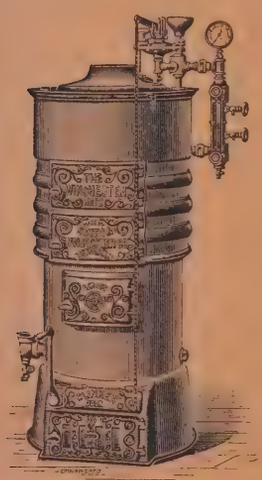
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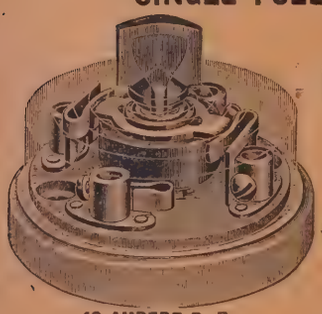
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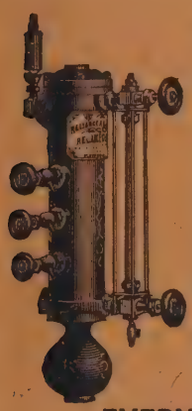
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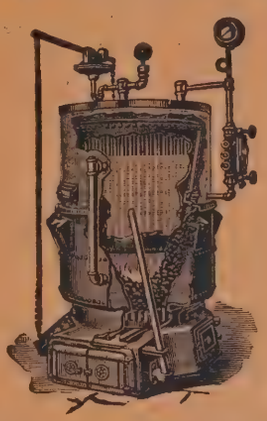
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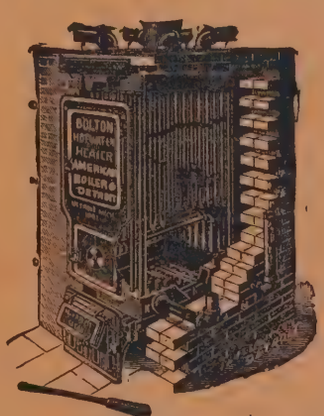


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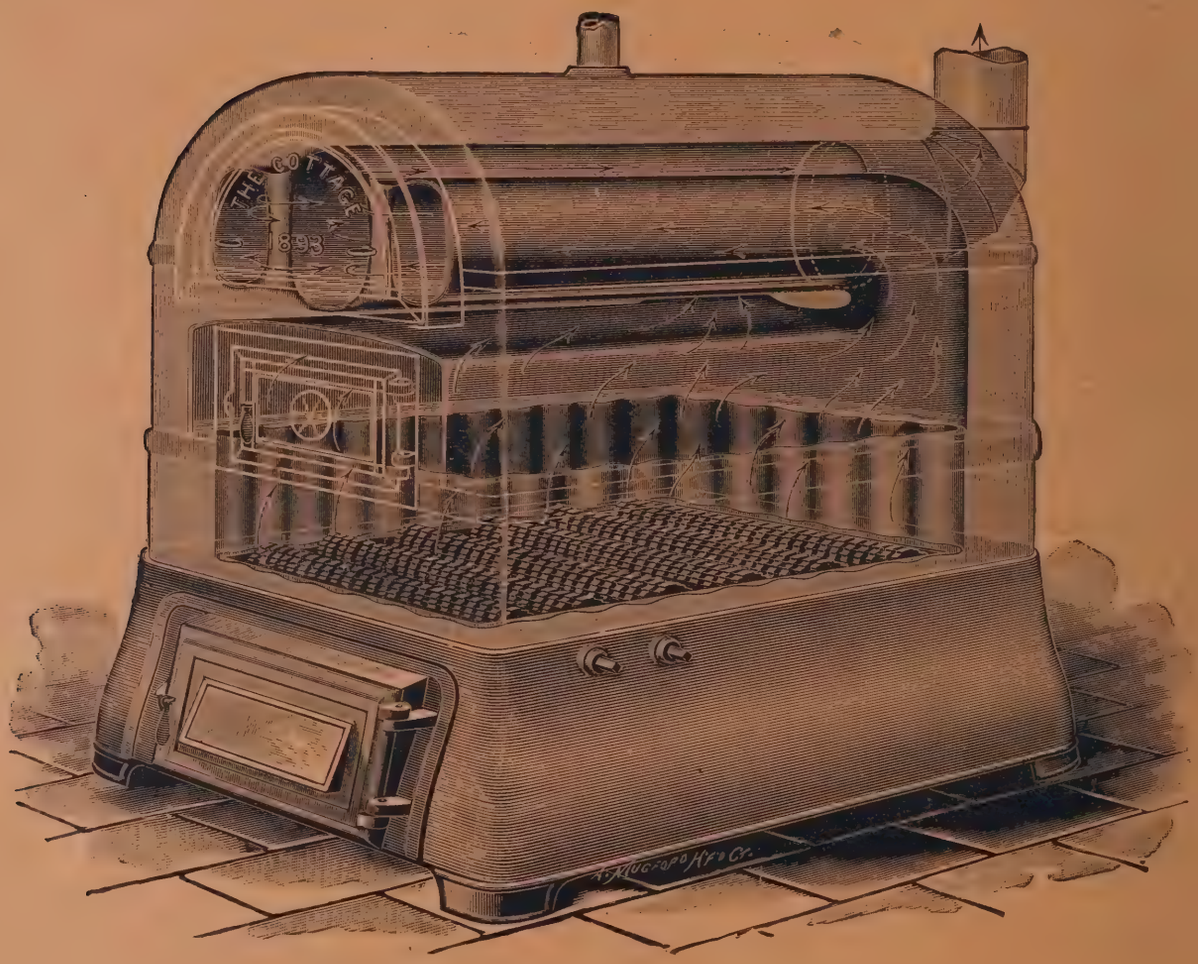
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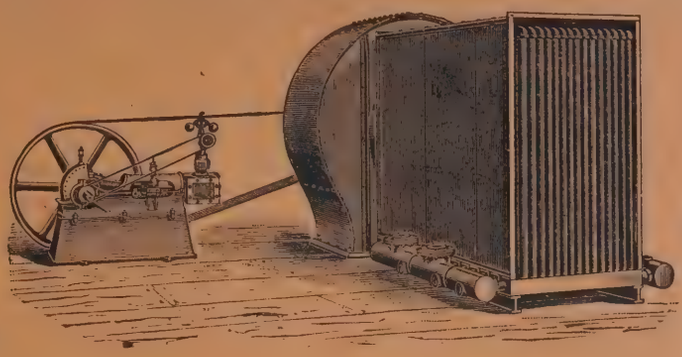
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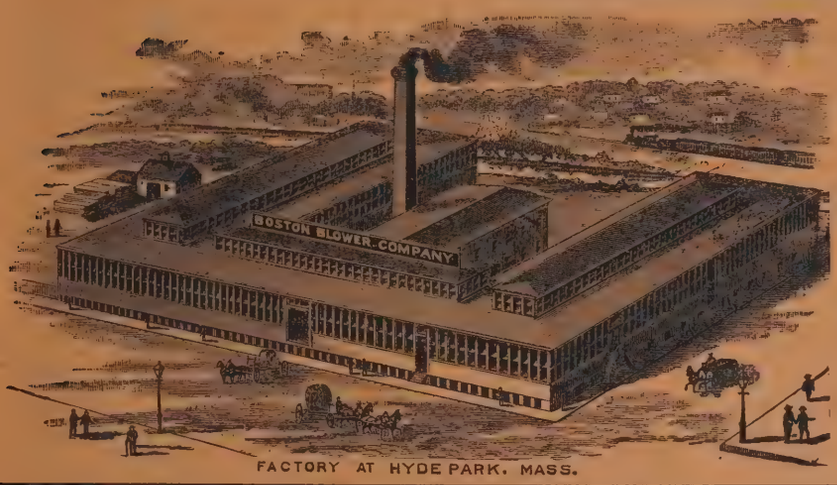


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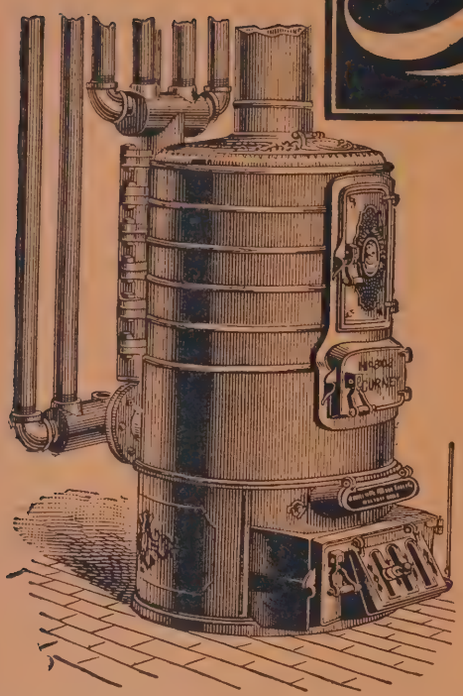
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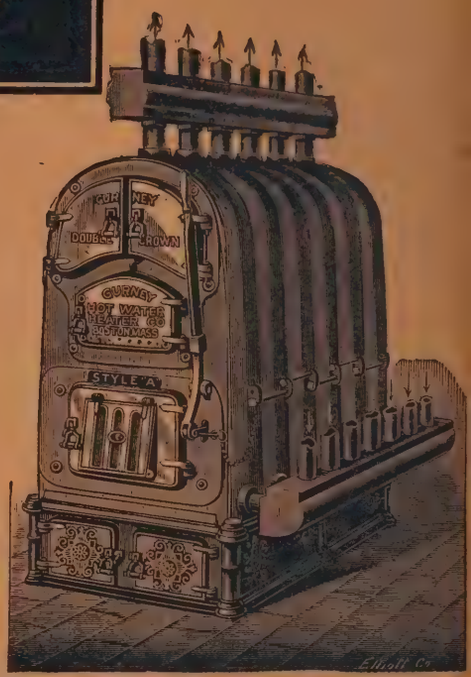
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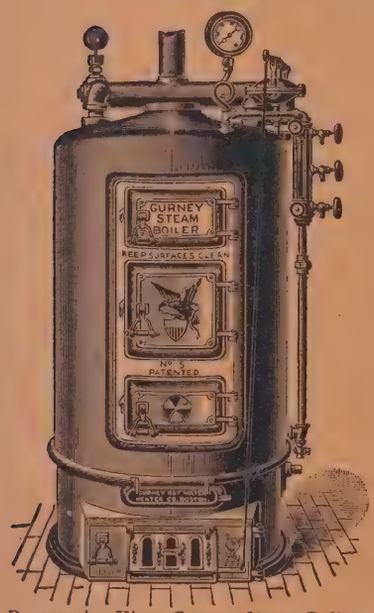
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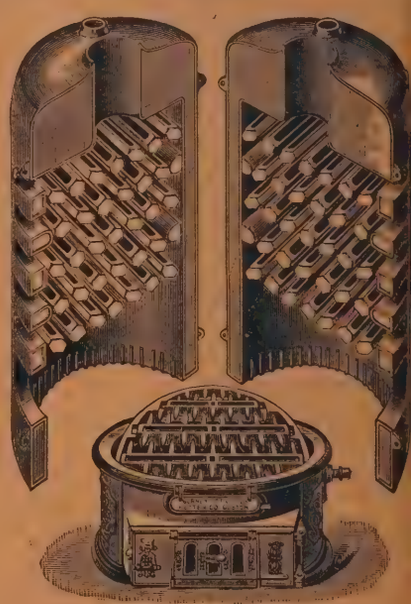
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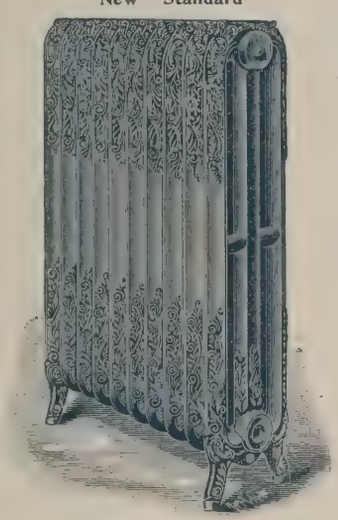
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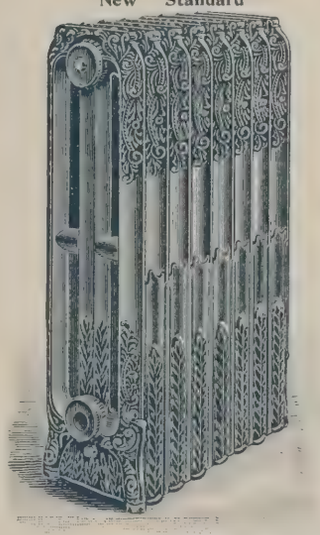
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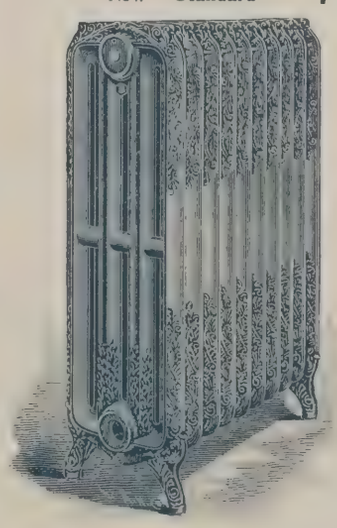


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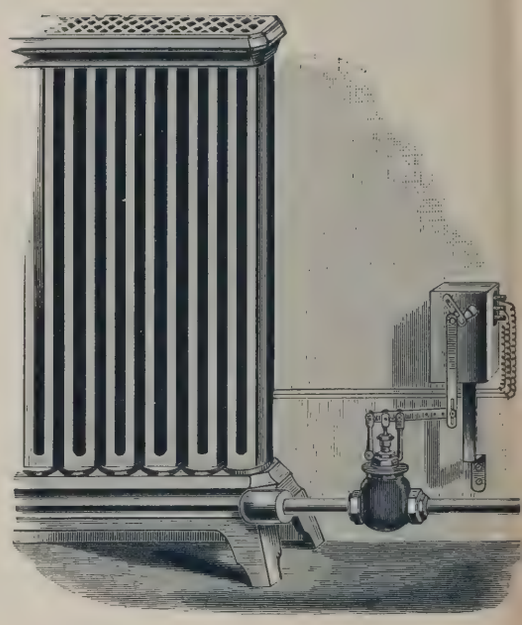
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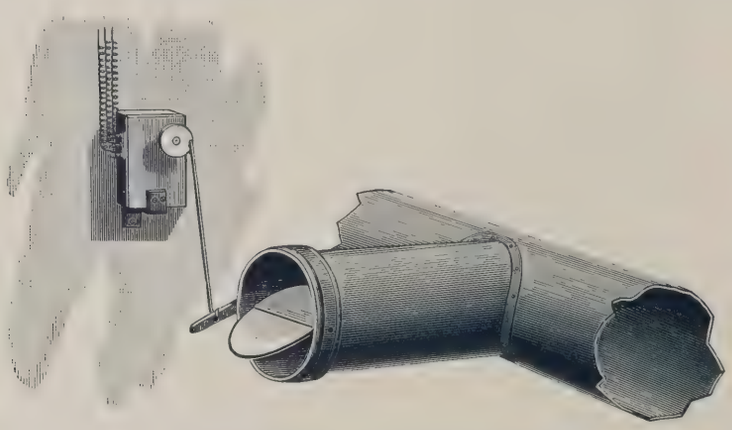
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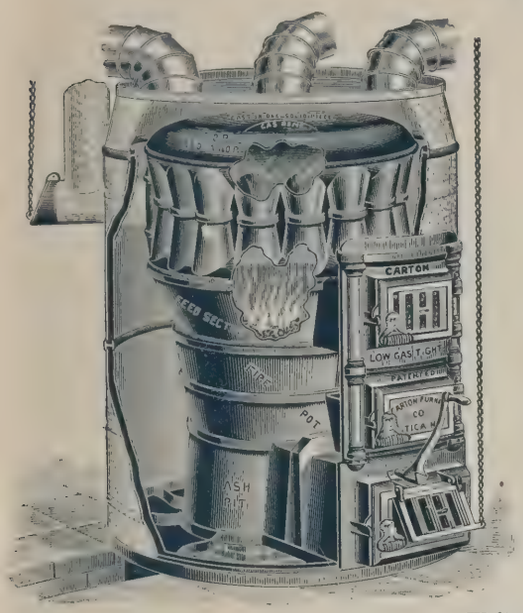
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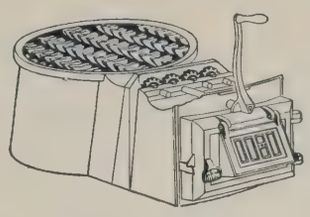
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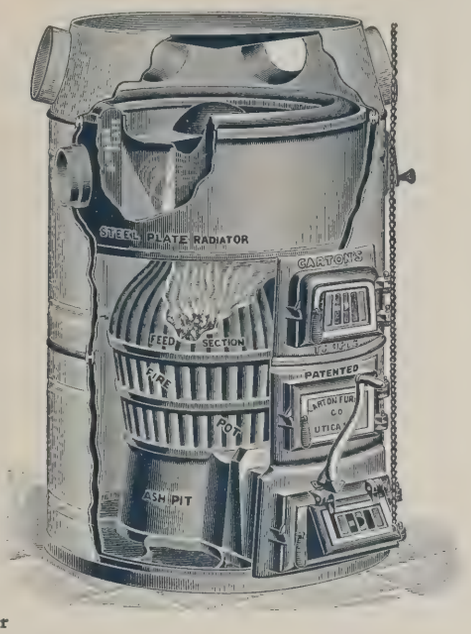
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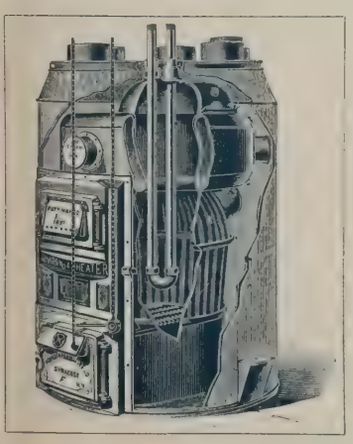
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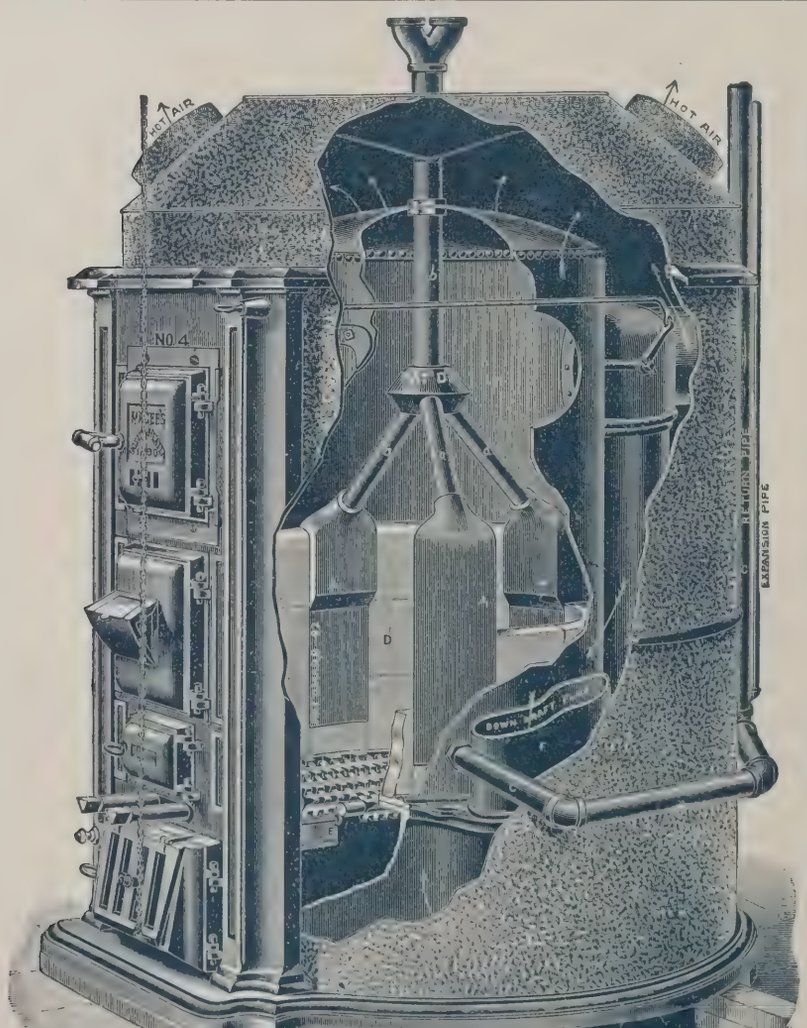
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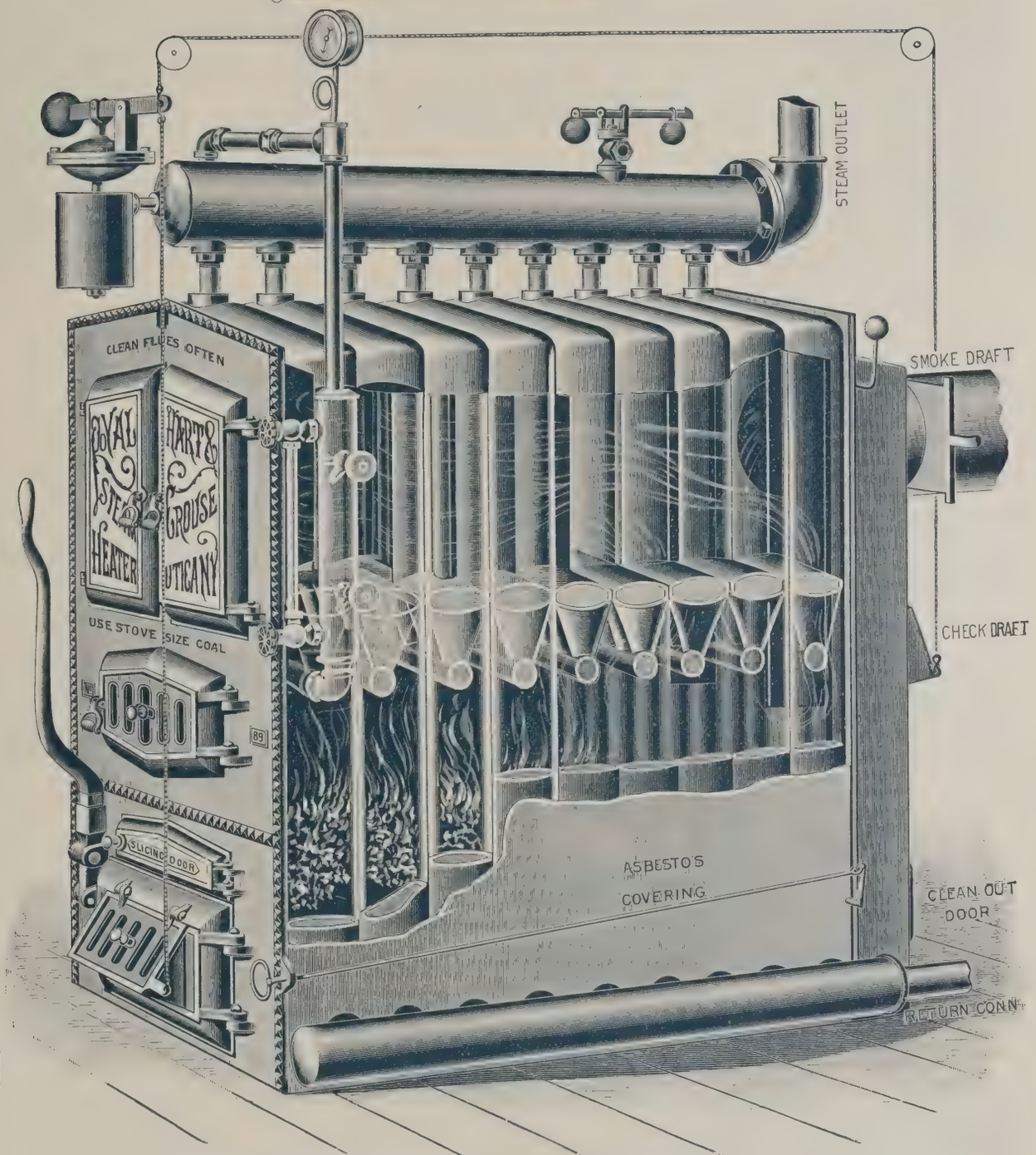
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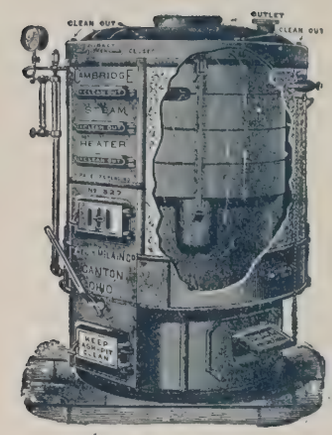
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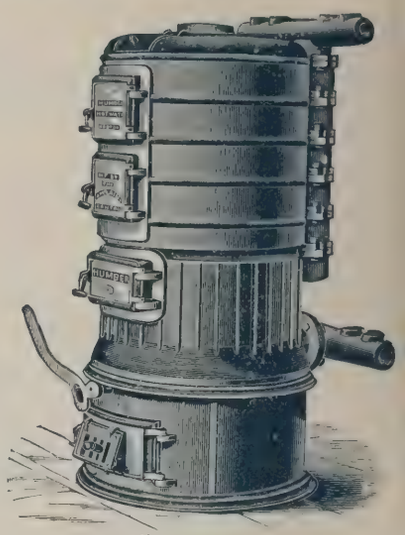
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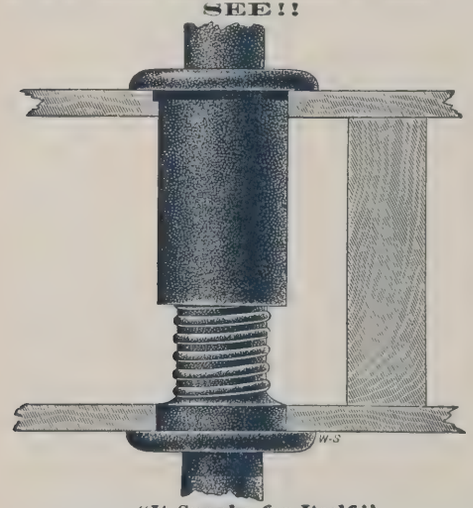
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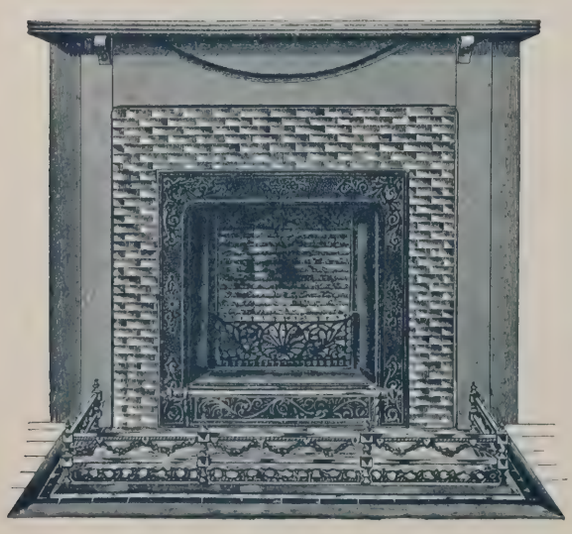
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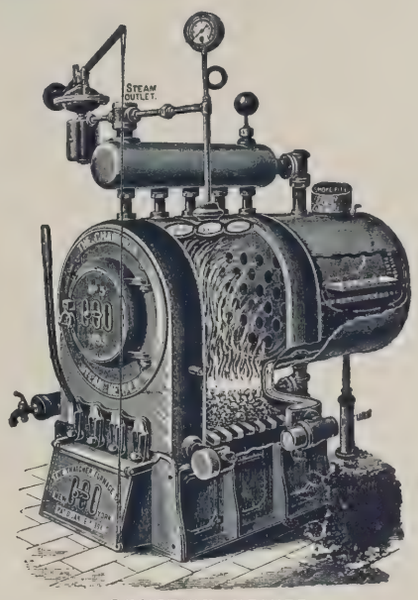
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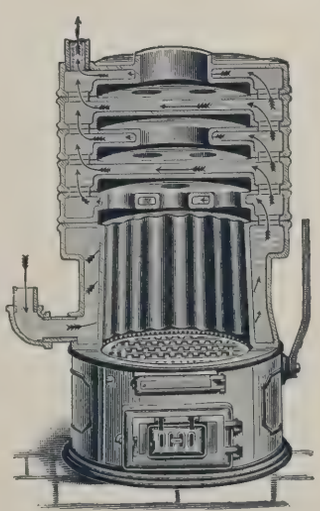
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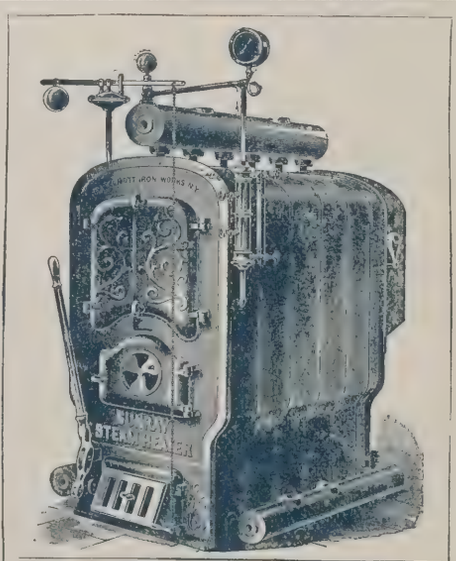
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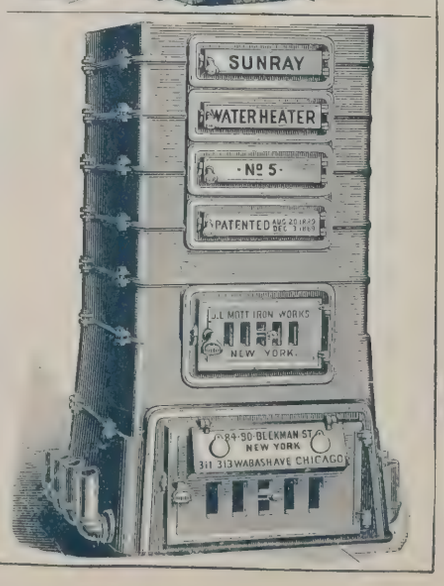
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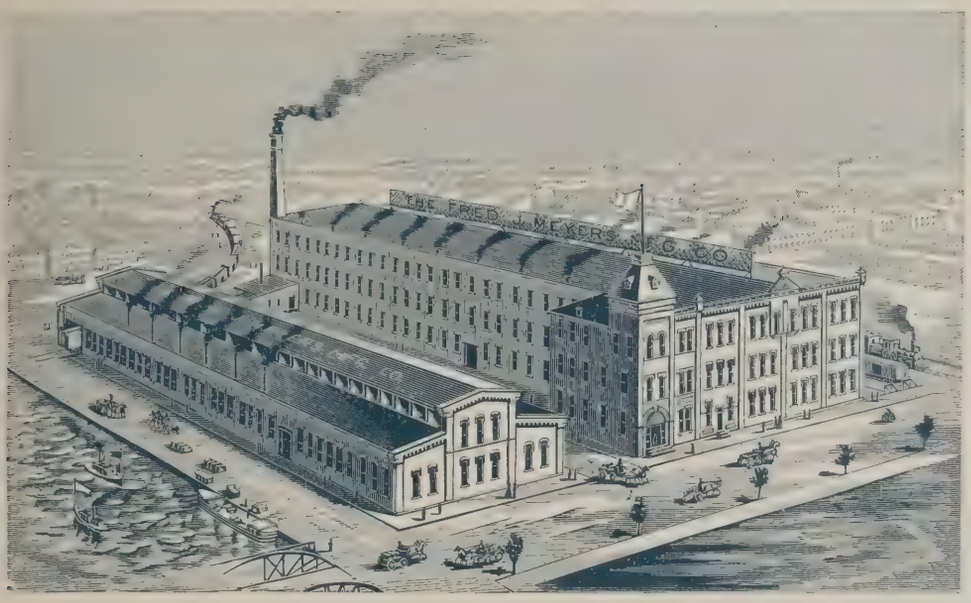
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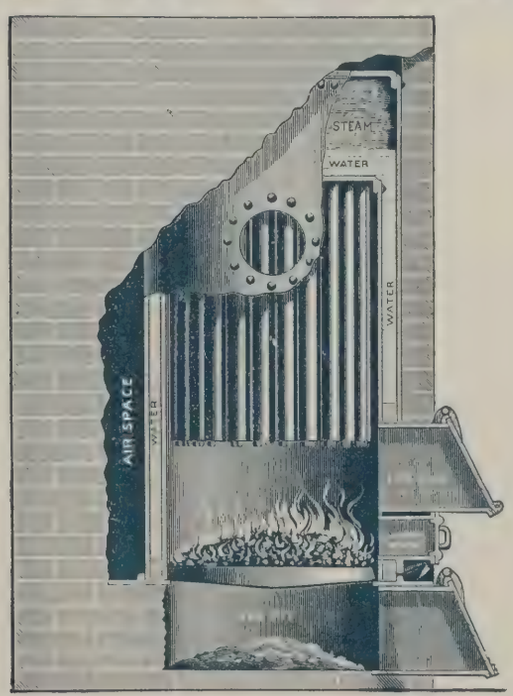
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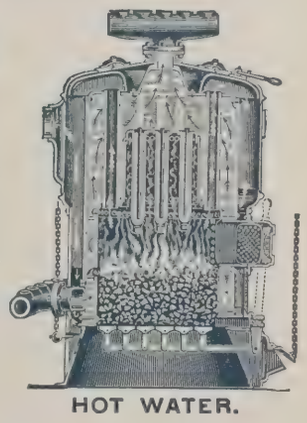
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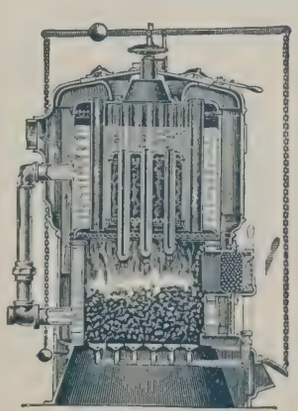
was idolized among the early races because of its Light and Heat. The fitter of this day praises the **Sun** boiler because it does all that is claimed for it and consequently is a money maker.



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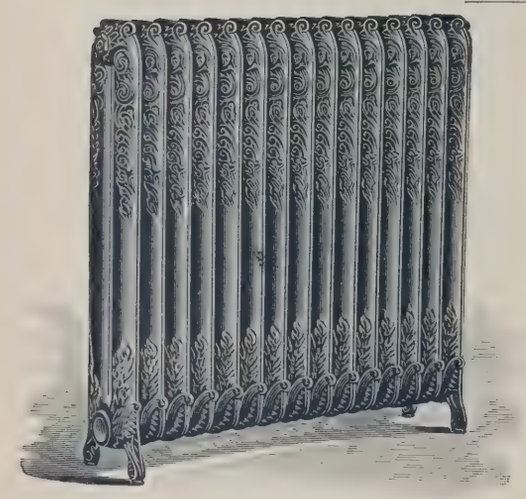
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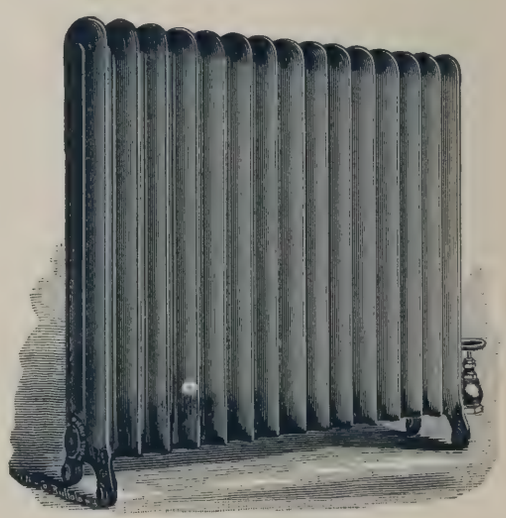
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Heating and Ventilation

NEW YORK. (Copyright, 1894.) November 15, 1894. (All rights reserved.) CHICAGO.

Modern Residence Heating Plant.

The accompanying plans and sketches, together with the following text, describe a system of heating installed during 1892 in a country house at Belle Haven, Conn., on the Sound. The half-tone views of the exterior are reproductions from photographs of the front and rear of the building.

The house, with its interior details, was built from plans by Messrs. Lamb & Rich, architects, of New York, and it was intended that the heating apparatus should conform in general excellence to the superior character of the building.

The heating plant was designed and its installation superintended by James A. Harding, of New York, to whom we are indebted for the following description:

The heater is a No. 48 Boynton cast iron sectional revertible flue hot water heater, having a grate area of 14 square feet. The indirect radiation is of the cast iron pin variety, manufactured by the Standard Radiator Co., of Buffalo, each section being 3½ feet in length, and having a surface of 10 square feet. The direct radiation is of the Detroit ornamental fluted pattern, manufactured by the American Radiator Co. The hot water fitting was done by the Blackmore Heating Co., of New York.

At the outset, and before the plans were completed, certain conditions to be met were made known by the architects, and were about as follows: Each room, hall, and corridor, with the exception of certain rooms in the third story, to be warmed to a temperature of 70 degrees F. (this temperature to be maintained with an outdoor temperature of zero). All of the principal rooms and halls in the first and second stories to be abundantly supplied with fresh, warm air, and to that end to be warmed exclusively by means of indirect radiation. The temperature of the air admitted to the rooms, in so far as the volume admitted could regulate it, to be controlled by adjustment from the main floor; all horizontal mains in the basement to be overhead.

The dimensions of the building are in the main 43 feet by 78 feet. The heights of the stories in the clear are as follows: Basement, 10 feet; first story, 10½ feet; second story, 10 feet; third story, 9½ feet. The total amount of space warmed is 67,000 cubic feet, of which 46,500 cubic feet is warmed by indirect radiation, and 20,500 cubic feet by direct radiation. The total amount of indirect radiation employed is 2,310 square feet, or an average of one square foot of surface for each 20 cubic feet of space.

The total amount of direct radiation employed is 717 square feet, or an average of one square foot of surface for each 29 cubic feet of space.



A MODERN COUNTRY RESIDENCE AT BELLE HAVEN, CONN., ON THE SOUND.

The total area of the chimney flues providing for the exhaust of air through the fireplaces from the rooms and halls warmed by indirect radiation is 7¾ square feet. The minimum velocity of air through these flues at such times as there are no fires on the hearths, and for an average condition of weather, may be approximately stated as 7 feet per second. With this velocity of discharge the volume per second will be $7\times7\frac{3}{4}=54\frac{1}{4}$ cubic feet.

The air should not enter a room, through a floor register at least, at a greater velocity than 4½ feet per second. Without taking into consideration the increment of volume due to expansion by heat, which is inconsiderable within the range of temperature involved in this case, the total sectional area of the cold air ducts should be $\frac{7\times7\frac{3}{4}}{4\frac{1}{2}}=12\frac{1}{5}$ square feet.

It will be found upon consulting the plans that the aggregate sectional area of the cold air ducts is 1,758 square inches, or $12\frac{1}{5}$ square feet. The sectional area of all the ducts bear the same ratio to the cubic space of the rooms to which they supply air.

It is a pretty generally recognized fact that under conditions similar to the present, and with ordinary velocity of inflowing air, the cold air duct supplying air to an indirect hot water stack should be equal in square inches of sectional area to ¾ of the number of square feet of heating surface in the stack. Inversely, then, it must be true that the stack should contain 1⅓ square feet of heating surface for each square inch of sectional area of the cold air duct.

For example, the cold air duct supplying air to the dining-room stack has a sectional area of 9×30 or 270 square inches; hence the number of feet of heating surface in the stack should be $270\times1\frac{1}{3}=360$, and the same proportions will be found to exist in the feature of the six other stacks.

The calculation immediately preceding is made tentatively, merely to show the consistency of the various features of the plant and not with the object of determining the heating surface required in the stack.

The registers are larger in area of free opening than the cold air ducts in order to admit the warm air through a larger area and reduce the velocity of the current. Each warm air pipe connecting a stack with a register in the first story has a sectional area equivalent in square inches to the number of square feet of heating surface in the stack. Warm air pipes leading to the second story, through which the air will flow with greater velocity, have a sectional area equivalent in square inches to ¾ the number of square feet of heating surface in the stacks.

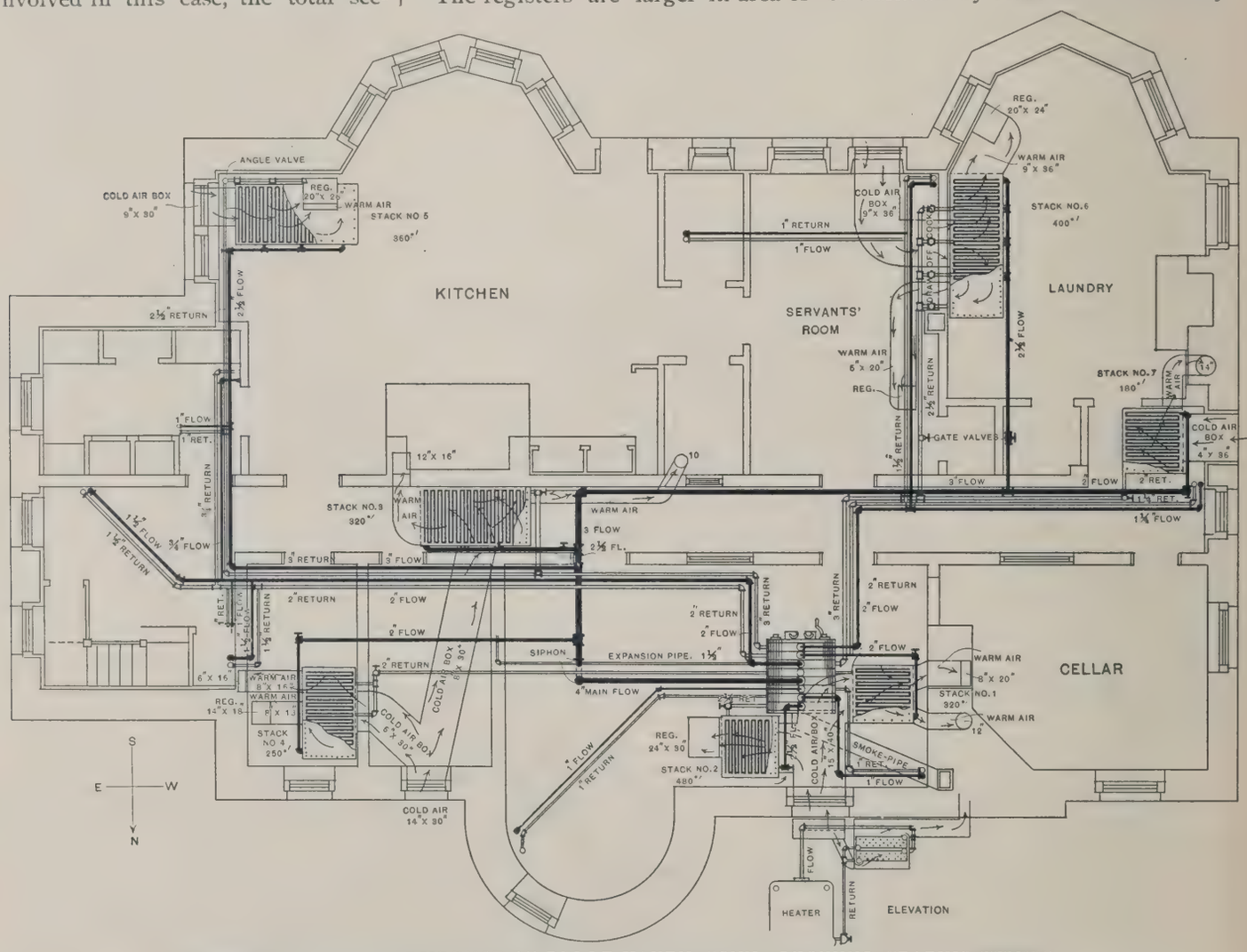
Theoretically, a room in which no provision has been made for the exhaust of air cannot be properly warmed by indirect radiation. Second story, and in some cases first story, rooms without means of exhaust can, as a matter of fact, be so warmed, however; but with the latter there is a larger element of doubt, especially when such rooms are isolated and the doors connecting them with ventilated portions of the building are closed.

The den in the first story, one chamber, and a boudoir in the second story, are rooms unprovided with exhaust flues and are successfully warmed.

It will be noted that the seven stacks of indirect radiation have substantially separate cold air ducts, a feature necessary to obviate the fault of unventilated rooms being deprived of warm air by reason of the tendency of the air currents toward the ventilated rooms. This fault will exist when the fresh air is introduced through a main trunk with tributaries to the various stacks.

The rule of arranging separate stacks for first story rooms has not been followed, in the conviction that its observance is unnecessary except when a first story room is comparatively at a disadvantage by reason of its lack of provision for ventilation or exhaust, the terms being used synonymously.

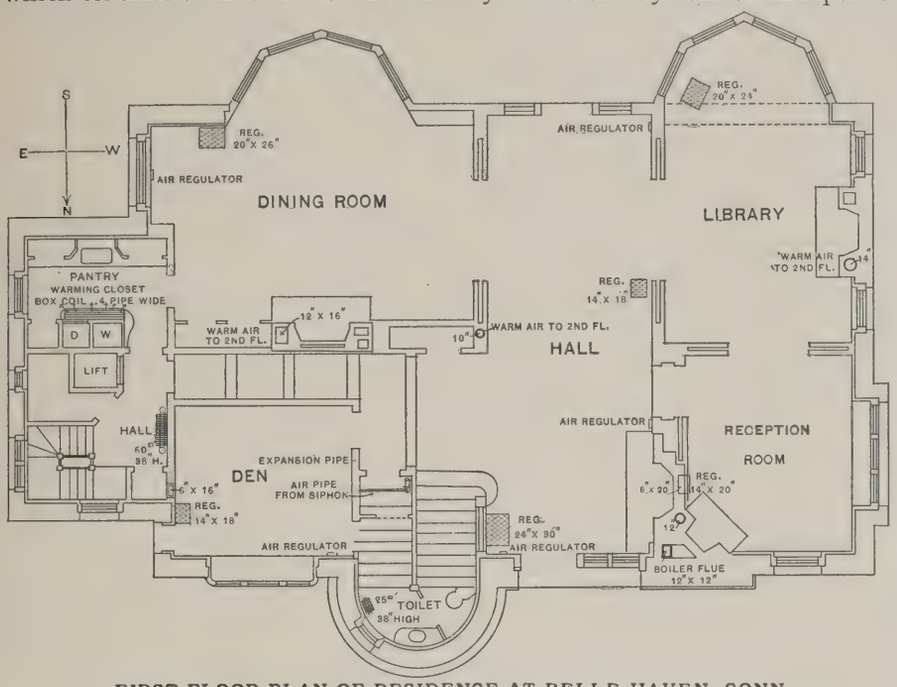
The positions of most of the registers were selected to subserve convenience in placing the stacks and running pipes, due reference being had



BASEMENT PLAN OF RESIDENCE AT BELLE HAVEN, CONN., SHOWING HEATING SYSTEM.

to the exposures of certain rooms. The position of a register in a well ventilated room of a dwelling is not very material in point of warming the room.

Each cold air duct is fitted with a loose fitting damper, the rod through which terminates in a lever. To one

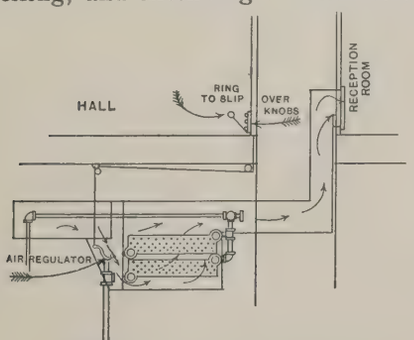


FIRST FLOOR PLAN OF RESIDENCE AT BELLE HAVEN, CONN.

end of this lever is attached a weight, which acts to open the damper, and to the other is fastened a chain passing over pulleys to an adjustable fixture on the baseboard of the room above. By this means the volume of incoming air can be reduced or regulated with reference to economy of fuel or varying demands for fresh air.

In order to provide for sufficient head room under the return pipes all the stacks, except the two near the heater, are made up in a single tier of sections hung 13 inches below the beams.

The beams above each stack are ceiled with narrow tongued and grooved boards one inch larger all around than the stack. This ceiling is lined with IX bright tin, turned over its edge, and the stack is encased with a galvanized iron box, fitting around and nailed to the edge of the ceiling, and extending 8 inches below



REGULATOR, STACK NO. 1.

the lower surface of the sections. The boxes are flanged and bolted together at the corners and can readily be removed.

The cold air ducts connect with an 8-inch chamber below the sections, and where practicable, at the end of the stacks opposite that from which the warm air pipe leads. A larger chamber of 12 inches above the sections provides for the uniform warming and distribution of the air when more than one pipe leads from it.

The circulation of the water through the direct radiation is accomplished by means of a system of independent piping. The circulation through the five stacks of indirect radiation more remote from the heater is by means of a single 4-inch main from the heater, carried up and down through a closet in the main hall, to form a siphon. This main pipe, its branches, and the return pipes from the stacks to the heater, grade downward continuously from the point where the main passes through the basement ceiling downward from the hall closet. The two stacks near the heater are hung in two and three tiers of sections respectively; they have independent flow and return connections with the heater, and are air-vented through ½-inch pipes tapped into the 4-inch main which rises from the heater to the siphon.

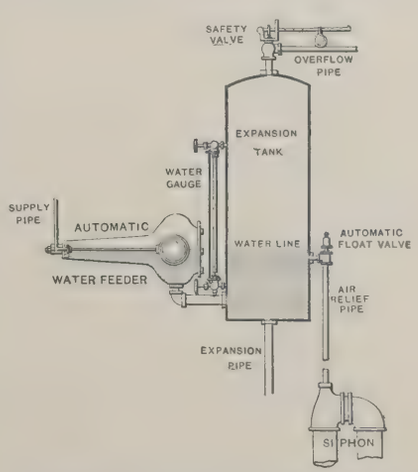
From the top of the siphon a ¾-inch air relief pipe is carried up to the expansion tank in the third story, thus providing for the automatic and constant relief of air from the stacks, mains, and connections. It will be noted that the air passes through the siphon circuit in a direction opposite to the flow of the water—another breach of a rule. A word might be said as to the merits of a siphon, but that would be too much apart from the object of this article, which is intended to be merely descriptive.

The coil in the butler's pantry is made four pipes in width and three tiers of pipes in height, with a space of 8 inches between the tiers for warming plates, and is inclosed with galvanized sheet iron. Registers are fitted into the closet door panels to provide for circulation of air and the warming of the pantry. The coil is connected with the flow and return pipes of the dining room stack rather than with second and third story pipes.

The sections in each stack are put together so that each group of not more, in any case, than sixteen sections or 160 feet of surface, has independent flow and return connections. Both mains to each stack are provided with valves so that any stack may be "cut out" of the "circuit" and drained for the making of repairs or other purposes.

The expansion tank is fixed to the wall in the third story near the ceiling, and is at a height of 40 feet above the heater, thus giving a pressure in the heater, due to head of water, of 18 pounds to the square inch. In the overflow pipe from the tank is placed a lever and ball safety valve. An automatic water feeder for maintaining a constant minimum water level is connected with the tank. By this arrangement the water can be heated under pressure to a high temperature, and any deficiency due to waste or evaporation supplied automatically. An automatic float air valve being placed at the water line, the air in the tank above the water line is not permitted to escape except when the pressure within the tank is sufficient to open the safety valve. By this means the air is compressed with the expansion of the water, and becomes an elastic "cushion" to receive the impact of the water due to the sudden and spasmodic expansion which occurs in hot water heating systems. The elasticity of the air maintains a steadier pressure in the system.

The space in the tank above the minimum water level is calculated to be a little more than sufficient to receive the increment of volume of the water due to expansion, in order that there may be an air space above the water when it is heated to the highest temperature reasonably attainable. The automatic air valve permits the air to enter the tank and occupy space in its upper portion whenever, by reason of the reduction of the fire, the water recedes from its maximum level of expansion; and the position of the



EXPANSION TANK AND CONNECTIONS.

valve is such that it permits the escape of air from the indirect stacks, mains, and siphon through the air relief pipe at all times.

In computing the amount of radiating surface necessary for the several rooms, due consideration was had for the relative positions and exposures

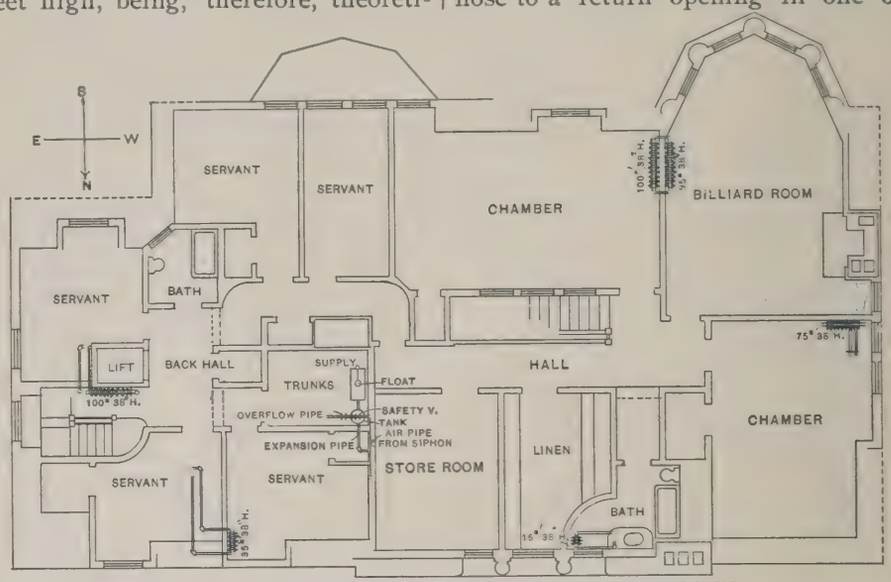
of the rooms; but no calculation of the loss of heat in units was entered into. The loss of heat in the basement from the stacks, the loss with the air passing out of the rooms through the fireplaces, and the absence of radiant heat from the rooms warmed by indirect radiation, necessitates, under conditions similar to the present, from 60 to 75 per cent more surface for indirect heating than would be required for direct heating.

The maximum ratio of indirect heating surface to space heated is 1 to 15 for the library and reception rooms, the minimum 1 to 25 for the hall and boudoir. The other ratios are 1 to 18 for the den and dining room, and 1 to 20 for the chambers. For direct heating surface the ratios are 1 to 30 for the dressing, bath, and toilet rooms, and 1 to 35 elsewhere.

The common method of defining the heater capacity as the amount of direct radiating surface it will "carry" is without doubt the most satisfactory when the heater has been tested, and it is assured that the manufacturer is not deceiving himself or his customers. Radiating surface exposed to currents of air from the exterior of the building will, under average conditions, transmit the heat units in the water one-half more rapidly than surface exposed only to the air of the apartments; hence, in this computation, each foot of indirect surface should be counted as 1½ feet. The amount of indirect surface is 2,310, and of direct 717. The heater capacity, therefore, should be 2,310+1,155+717=4,182 square feet, to which must be added the surface of exposed mains, risers, and connections.

Of the whole structure of a heating plant the chimney flue is the keystone, and deficiency or faultiness in this accessory will demonstrate the analogy of an otherwise excellently proportioned plant to Artemus Ward's model ditch—"beautiful in conception, symmetrical in harmony of detail, but high at the wrong end."

The heat units to be distributed are dormant in nature, or specifically, in coal, and an energy in horse-power of the chimney flue must be developed in order to extract and disseminate these potentialities. The smoke flue for this heater is lined with tile, 12 by 12 inches in section, and about 50 feet high, being, therefore, theoretically, of 20 horse-power. The front elevation of the building shows the chimney to be above and consequently unaffected by other portions of the structure.



ATTIC PLAN OF RESIDENCE AT BELLE HAVEN, CONN.

The water in this apparatus (as has been demonstrated by test) can be circulated at temperatures through a range of more than 180 degrees F.; hence any ordinary disproportion of radiating surface can readily be adjusted in effects by manipulation of the valves.

The house was finished and completely furnished for occupancy before a fire was built in the heater, but had not been occupied before the test of the apparatus was made, nor had any fires been kept in any part of the house prior to that time.

The following is the report of Joseph H. Smith, who was directed by the writer to make the test:

"Dec. 29, 1892.—Arrived at the house at 9.30 a. m. Temperature outdoors 13 degrees F., in the house 15 degrees F. Built a light fire of shavings in the heater to raise its temperature gradually above the freezing point and commenced to fill the apparatus. The plumbing in the house having been drained, I coupled a hose to a return opening in one of the sections of the heater and let the water in very slowly, keeping a light fire the while. By 5 o'clock had the apparatus full, and a coal fire started and banked for the night.

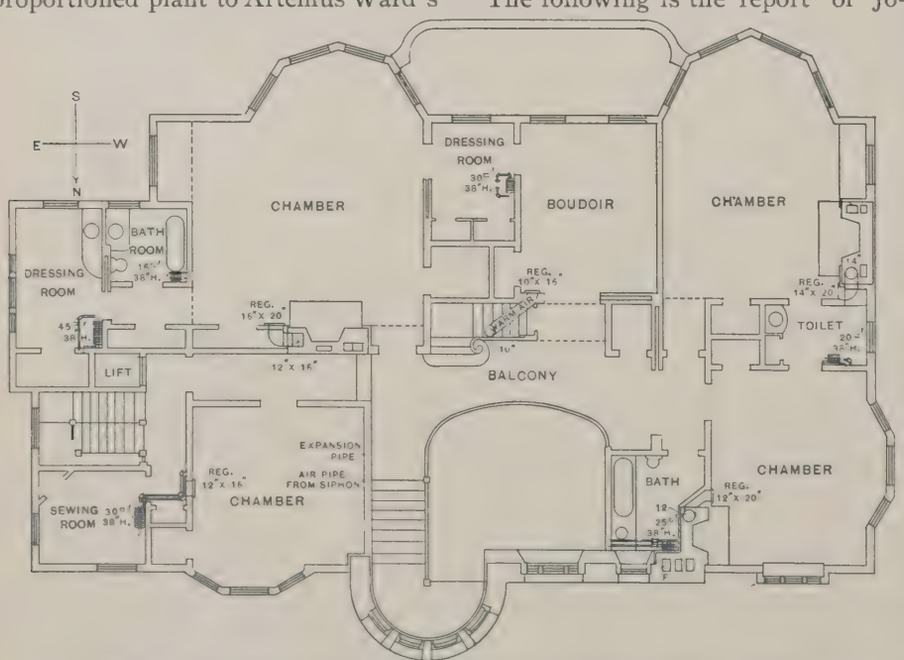
"Dec. 30.—Ran a slow fire all day and warmed the house up gradually so as not to injure the decorations. Let the air out of the direct radiators from time to time, and banked the fire at night. Mean outdoor temperature for the day, 21 degrees F.

"Dec. 31.—At 8 a. m. stoked the fire, put on coal, opened the drafts of the heater, set all valves in the system wide open, and set the safety valve at 20 pounds. At 11 a. m. the temperature outdoors was 19 degrees F., in the main hall 104 degrees, dining room 98 degrees, den 98 degrees, reception room 98 degrees, library 99 degrees, and the rooms in the second and third stories at from 93 to 98 degrees. The temperature of the air discharging from the register in the main hall near the staircase was 247 degrees F.

"During the time the temperatures were being taken the pressure was intermittently lifting the safety valve and discharging water. After taking temperatures I inspected the whole apparatus and found it tight; then opened the feed doors of the heater and reduced the fire. The windows were also opened, and the temperature of the house lowered to 70 degrees F. I then let in enough water to make up for the overflow and show the level in the gauge glass of the expansion tank, and closed the feed doors of the heater and the check in the smoke pipe."

The writer arrived at the house at 4 p. m. on Dec. 31, and found an average temperature in the house of 85 degrees F., and a temperature out doors of 15 degrees. There was at this hour a medium fire in the heater, and no pressure on the safety valve.

From Mr. Smith's report it appears



SECOND FLOOR PLAN OF RESIDENCE AT BELLE HAVEN, CONN.

that there must have been at 11 o'clock, when he took the temperatures, a pressure in the heater equal to 20 pounds on the safety valve plus 18 pounds due to head of water, or 38 pounds to the square inch.

The high temperature of the air from the hall stack is due to the passing of the air through three tiers of sections, the proximity of this stack to the heater, and its direct and independent flow and return connections. It is to be regretted that the temperature of the air discharged from the other stacks was not taken.

The dampers in the cold air ducts were wide open during the test, and the volume of air admitted and discharged was, in the judgment of the writer, somewhat in excess of the volume approximated in a preceding paragraph.

Warm Air Heating.*

Passing over that period when the log fire, the wood stove, and the unsightly coal, egg, or globe stove were known as the only agencies of heat, and whose capacity for giving comfort depended upon one's closeness to the fire, so that while the intense rays of the heat would be felt on one side of the body, a chill equally as unbearable was felt on the other, we come to the time when the base burner, steam heater, hot water boiler, and the warm air furnace became of general use, so that they alone occupied the thought of manufacturers and the attention of the purchaser. At this period the difference between direct and indirect radiation and the distinction between the two were not generally recognized.

We may briefly explain that direct radiation is bringing in contact with a heated surface the air within the building; indirect radiation is bringing air from the outside, passing it over a heated surface, and discharging it within the building.

The base burner is direct radiation. Its first production differed from articles of prior use, not alone in a more attractive appearance, but by longer retaining the heat and by further carrying the combustion, thus radiating more heat with a given amount of fuel; under this construction the base burner was equal to the work of uniformly heating a room of medium size in all parts to about the same temperature, afterwards by the insertion of a circulating system within the stove, circulation of air within the room was accomplished, thus it was possible to heat and practically keep alike the temperature in *two* rooms. When this fact was established, those occupying large houses had in use several base burners, so that in this way a uniform temperature was kept throughout the house.

To this system many objections were soon discovered; first and foremost of all, owing to *direct* radiation, the same air was heated and inhaled over and over again, thus while the comfort of warm air was secured it was at the expense of health. In addition to this, much annoyance was caused by the labor of putting up and taking down stoves and stove pipes, of cleaning them, the inconvenience and unsightly appearance of so many stoves, the labor, dirt, and expense caused by carrying fuel and keeping up so many fires.

These difficulties, in addition to the more serious one of impure air, gradually caused the base burner to give way to one heating apparatus, which could be placed in the cellar, with heating flues or pipes leading to the different apartments.

This system is to-day generally accepted in the market and known under three heads, viz: The steam heater, hot water boiler, and warm air furnace. All these cannot be alike in the successful results obtained, therefore, which is the best for the purchaser? This question we shall aim to aid in answering. The steam heater, hot water boiler, and warm air furnace were placed on the market about the same date. The three styles of heaters have in common the advantage of a single fire, and all can be made of either cast iron, steel plate, or wrought iron; at this point they separate in accomplishing the result desired.

In the steam heater wrought iron pipes filled with steam are connected to the different apartments, and by means of radiators bring a heated surface in contact with the air. The air being raised to a higher temperature than that in the remote parts of the room, by natural laws of gravity, finds its way to the ceiling; the cooler air in the room takes its place, coming in contact with the heated surface of the radiator. Thus, the air of the room is not only raised in temperature, but practically kept at a *uniform* temperature throughout.

The same principle and the same result is accomplished by the hot water boiler, except that the wrought iron pipes leading to the different rooms and connected with the radiators are filled with heated water. These results differ in no wise from the base burner, except having one fire to receive attention in place of many, but the system of *direct* radiation remains the same, viz.: The same air being heated over and over and taken into the lungs.

The warm air furnace brings from outside of the house a constant current of fresh air, carries it over a heated surface, discharging it by means of tin pipes into the different apartments. It is therefore readily seen that the warm air furnace accomplishes the same result as the steam heater or hot water boiler, but for the first time in the history of heating, our houses were warmed by fresh air, viz.: *Indirect* radiation.

Under this system the fresh air inhaled is equally as pure and healthful as that out of doors. At this time the principles involved and the difference between direct and indirect radiation were recognized. Many who had previously purchased a steam heater or hot water boiler on the theory, no doubt, that being the most expensive it must be the best, removed it and placed instead a warm air furnace.

At this time manufacturers of steam heaters and hot water boilers were rapidly losing ground, and realizing the advantage of *indirect* radiation sought in their construction, at a great expense to the purchaser, to meet this advance in science, which has been accomplished by the warm air furnace. This they have succeeded in doing, viz.: By removing the radiators placed within the rooms and by bringing currents of fresh air over coils of pipes filled with either steam or hot water, and discharging this air so heated into the rooms.

This brief history of heating apparatus may be of interest to our readers. We believe it proves that through the warm air furnace was first introduced the system of *indirect* radiation and to-day, with the Kernan system of ventilation forming a part thereof, it is the one system of heat whereby with a single fire a house can be perfectly heated and thoroughly ventilated.

Those interested in steam or hot water may use this argument: In your house, costing $40,000 or upward, are many rooms; some of these rooms are situated far from the heater and may be exposed to the winds; these rooms are not directly over upright partitions—warm air passing through tin pipes with right angle bends will not reach these rooms.

This likely is true; it is likely true that neither will warm air in a steam or hot water system by *indirect* radiation reach the same room, but the steam and hot water dealer will say: "In these rooms we will place a radiator," thus in that room you will receive direct radiation.

Ventilation is changing or removing any given quantity of air within any given period of time. If this can be accomplished with a warm air furnace, with warming the house by means of fresh air, the *science* of heating has again advanced. To explain the Kernan system of heating and ventilation as applied to private houses, it may be said that a continuous current of fresh air is discharged in each room of the house, and with the same furnace the foul or vitiated air in like volume is removed by connecting the hall with the ash-pit of the furnace, so that the foul air serves to support combustion, at the same time being carried into and out through the chimney, thus changing the entire air of the house any number of times per hour desired. Or, by connecting the hall outlet to the cold air supply, circulation is accomplished. Bear in mind that this latter construction secures *circulation* and *not* ventilation.

Many believe that ventilation is not a part, or within the scope, of a heating apparatus, but, on the contrary, without some system of ventilation it is not possible to successfully warm a

*Taken from the new catalogue just issued by the Kernan Furnace Co., Utica, N. Y.

building. We refer to *indirect* radiation, as at this time we do not suppose any one knowingly would place in their house a system of *direct* radiation. The successful working of indirect radiation depends entirely upon the movement of heated air, based on the fact that warm air is lighter than cold, and owing to this fact it ascends from the heater in the cellar to the apartments above. To show how necessary ventilation is in connection with any system of heat from indirect radiation, we cite, for instance, a pail filled with water—no more water can be added until some has been discharged; or a tube filled with air, could more air be added until some had been removed? And so with indirect radiation as applied to warm air entering a room; the room being tightly sealed, with no outlet for air, how can any more air find an entrance? It is for this reason, perhaps, more difficulty is found in the successful heating of small houses than in larger ones; the larger houses having fire places and opportunities for at least circulation of air, if not ventilation; in the small house there is often no outlet, and on cold days, with a strong wind blowing against the house, warm air is absolutely prevented from entering the apartments through the register.

Fig. 1 shows the Kernan system more thoroughly arranged, viz.: Taking an exhaust pipe from each floor of the house, carrying these exhaust pipes into a heater box over the furnace, connecting it to the chimney flue. By means of this heating box and its connection to the heating flue of the chimney one receives a perfect system of ventilating. Through each one of these exhaust pipes air will travel at the rate of 500 feet per minute, so that with a house containing 25,000 cubic feet, the entire air of the house can be changed once or more times per hour.

In Fig. 2 is shown the Kernan system as applied to a hall or a church, where one register is used, and where a foul air exhaust flue is connected with the chimney stack. Fig. 3 shows the Kernan system of heating and ventilation as applied to school buildings. The school house here represented shows warm air passing

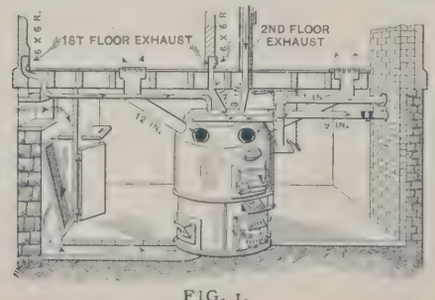


FIG. 1.

into each room at or near the ceiling, the foul air being removed at the base or on the floor through flues built in the wall. Through these flues air passes down to the bottom of the ventilating stack and is discharged by it at a point above the roof. To describe this system of ventilation, it might properly be said that it is a warm air furnace working in the opposite direction, creating a suction and consequently *ventilation*.

A small furnace is placed in a stack. This stack extends through the roof of the building, and is connected at its base with flues opening into each room of the building, and consequently the openings being on or near the floor, the heavy or foul air which there gathers will be drawn through these openings into these flues, thence into the ventilating stack and discharged outside of the building. While this is being accomplished the warm air enters the room near the ceiling. In proportion to the size of the inlet and outlet, the air in any room can be changed any given number of times per hour.

There have been and are failures and partial failures in warm air heating. We will give some of the reasons for this: There are a large number of people in the furnace business, and competition is very keen. For our part we do not complain of competition; it only spurs us on to greater efforts, but there is a limit beyond which no one can go and furnish a good and well-constructed warm air heating system.

When, through stress of competition or other reasons, that limit is overstepped, a furnace too small is put in; insufficient sizes of warm air and cold air ducts are used, proper location of the furnace and other things slighted or left undone, and

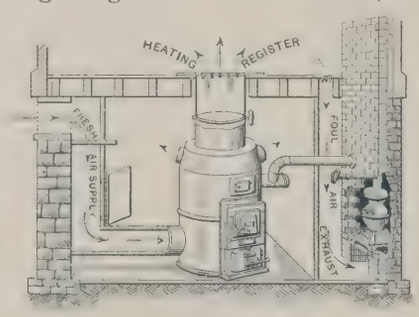


FIG. 2.

above all no regard is paid to the proper system of *ventilation*.

There is no economy in putting in a small furnace; it should always be large enough to heat the building easily in the coldest weather; it can then be run easily through the severest winter weather. The furnace will last longer and will not burn so much fuel. In selecting a furnace the purchaser has many things to consider. In the first place he wants a furnace that is a good heater. But the furnace must also be economical in the consumption of fuel.

The market is full of different constructions of heaters, many of them good ones, but experience has shown that the construction is best, that, in addition to a large firepot, compels the smoke, after leaving the combustion chamber, to travel around the radiator before finding an exit to the chimney, provided this construction is not complicated and that ample provision is made for cleaning the radiator, so that the efficiency of the furnace is not impaired, nor corrosion caused during the summer months when the heater is not in use. When the chimney flues are properly built, it is possible to make the smoke travel a considerable distance, and thus obtain economy of fuel.

In addition to heating capacity the furnace should have good working conveniences, so as to cause the pur-

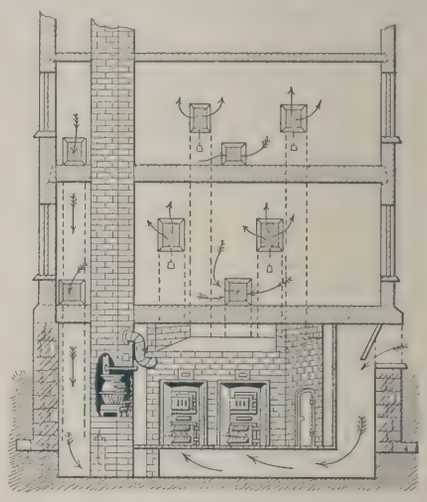


FIG. 3.

chaser as little annoyance as possible in operating it. It should have facilities for regulating the drafts from the floor above. It should have an easily working grate; also a large ash pit and some arrangements for dumping the fire, and for freeing the grate of clinkers without disturbing the fire. These points found, the durability of the furnace, and the ease and economy of repairing it should be considered. The parts liable to burn out should be heavy and durable and so arranged that they can be easily replaced when they have to be renewed. The general appearance of the heater should be attractive, the parts well proportioned, and the castings well fitted. The furnace should be a *sanitary heater*, or, in other words, a gas-tight furnace, as we all know that coal gas is injurious to the health.

With such a furnace as here described, of sufficient power, carefully put in, combined with the Kernan system of ventilation, excellent results can be obtained with proper management, and both buyer and seller will be satisfied.

It is impossible, even with the best care and attention to prevent all boiler explosions, but that there would be less of these disasters no sane man can doubt if inspection were more conscientious, and the men in charge always what they ought to be, both in practical knowledge and honest vigilance.

Blisters in boilers are due to imperfect welding in the manufacture of plates. They should be trimmed off to ascertain their extent and thickness, and if of small area and slight thickness, are not dangerous; but if the contrary is the case, or if the plate is cracked under the blister, they must be cut out, and a "hard patch" put on inside the boiler to avoid a pocket for the collection of sediment.

Steam Fitters' Guide.

Q. 120.—When two radiators are placed on the same floor, one on each side of a partition, how are the con-

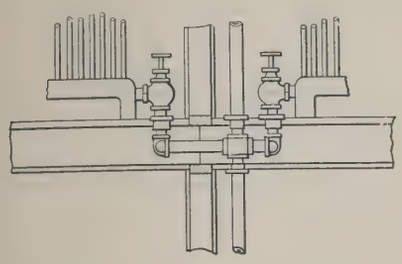


FIG. 1.

nections made for supplying steam to the radiators from the riser underneath the floor on which they rest?

A.—Under the conditions named, a cross is placed in the riser, and the connections made as shown in Fig. 1. Crosses should be used on short risers only, as no allowance can be made for expansion, which, if considerable, will lift the radiators from the floor, when the cross is liable to break.

Q. 121.—When one riser is used to supply two radiators, one on each side of a partition, on the same floor, how may the connections be made at

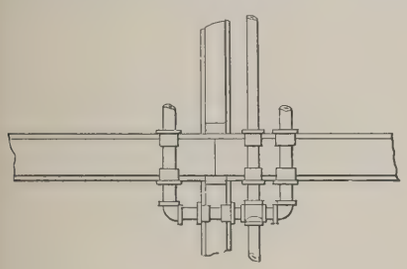


FIG. 2.

the ceiling below the floor on which the radiators are placed?

A.—A cross is placed on the riser to receive the branch pipes, which are run as shown in Fig. 2.

Q. 122.—How is the connection between riser and radiator made above the floor?

A.—A tee is set in the riser with its side opening toward the room. A nipple is screwed into the tee, and on to the nipple is screwed an ell, into which is screwed a nipple, on the other end of which is placed an ell that receives the nipple to which the corner radiator valve is attached. The tee in the riser is placed near the floor, so as to give a good drip back from the radiator to the riser. Fig.

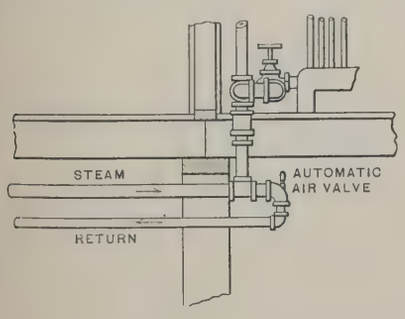


FIG. 3.

3 is an elevation of this connection, which may be used on risers of any length, the riser being free to expand.

Q. 123.—How are return and drip connections usually made in this character of work?

A.—For small house work, as shown in Fig. 3, a drip and return pipe can be taken from the end of the steam main, into which all branch pipes to the radiator on the first floor and all risers can drip back. In large buildings, however, it is best to take a drip pipe from the branch pipes to the radiators and from the bottom of risers, connecting to the main return pipe. In all steam work the main supply pipes must drip away from the boiler, and an automatic air valve should be provided, and placed, as shown in Fig. 3, to relieve the steam main of air, and to allow air to enter

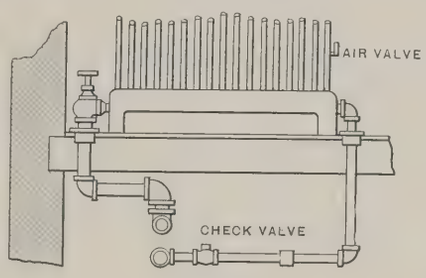


FIG. 4.

the pipe when the system is not in use.

Q. 124.—In one-pipe work, how should connections be made to radiators of large surface, say of 100 or more square feet?

A.—Instead of using a one-pipe connection, the best practice is to use a two-pipe connection, as shown in Fig. 4, especially when the radiator loops are connected by nipples, as the opening between the sections is so small that a perfect circulation is not

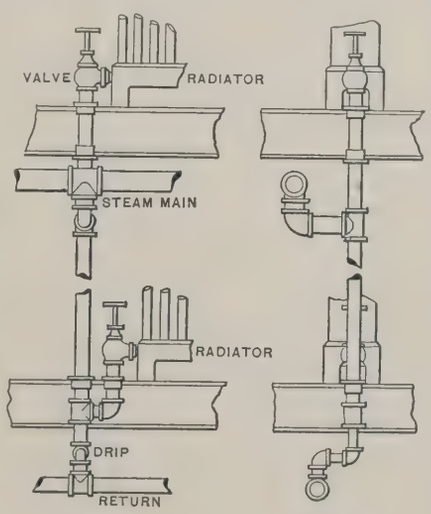


FIG. 5. FIG. 6.

possible, and the radiator is liable to fill with water. The return pipe, in which the swinging check valve is placed, is made level, for if it has a drip to the return pipe the valve will not close tight, and steam and water will back up into the radiator when the valve on the radiator is closed.

Q. 125.—How should connections to radiators be made where there is not room to run the steam main under the first floor?

A.—Fig. 5 shows the steam main at the ceiling of the first floor, with branches up and down to the radiation, and with the return main under the first floor, Fig. 6 being a side or end elevation of the same connections.

Q. 126.—Where it is necessary to

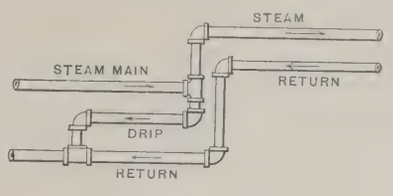


FIG. 7.

carry steam a long distance, how should the connections be made so that the steam pipe will not drop too low?

A.—By using a drip connection from the main steam pipe to the main return, as shown in Fig. 7, the steam main can be raised to the ceiling as often as necessary to keep it from dropping too low, and may be carried in this way as far as 500 feet without having the end more than 6 inches lower than at the boiler, still preserving a drip away from the boiler of not less than ½ of an inch in 10 feet. In such long lines of pipe it is good practice to keep the piping of the same size throughout its entire length.

Q. 127.—When a riser is carried up in the corner of a building, how should connection to it be made?

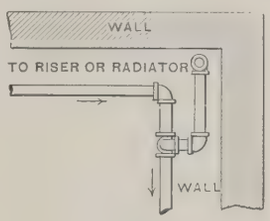


FIG. 8.

A.—The connection is taken from the top of the steam main to insure dry steam, the branch pipe being taken off after the pipe has passed the corner, as shown in Fig. 8. This manner of making the connection makes provision for expansion and allows for a good drip from the riser back into the main steam pipe which drips from the boiler, as shown by the arrows.

Q. 128.—How are risers supported in high buildings?

A.—A coupling is placed on the riser, over which is then slipped a cross with side openings to take 1 or 1¼-inch pipe. Into the cross are screwed short pieces of pipe that will carry the weight of the riser, near the middle of which the support is placed so that the riser will be stationary at the point where it is suspended,

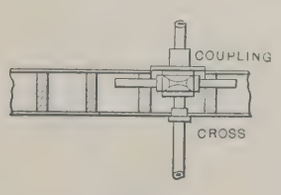


FIG. 9.

and the expansion will be divided equally up and down from the point of support.

(To be continued.)

Hot-Water Heating and Fitting.



The following matter is written in the hope that those who are connected with the above subject will find some few points of interest in it. It is written in the form of questions and answers such as would be asked by, and given to, a man in the trade who was looking for information:

Q. 1—What is hot water heating?

A.—It is a system of circulating hot water through coils, radiators, and pipes in a building from a heater placed in the basement.

Q. 2—What causes the water to circulate?

A.—Differences in the specific gravity or weight of the water in different parts of the system.

Q. 3—What causes the differences in the weight of the water?

A.—When the system is first filled with water it is practically of the same temperature and therefore of the same density throughout, but as soon as water is heated its particles expand. As they increase in size without gaining in weight they become relatively lighter than the more dense particles of cold water that have not yet absorbed any heat from the fire. When any portion of the water in the heating system is warmed it is at once crowded out of its place by the heavier particles of cold water which push the warm water to the highest part of the system. Thus there is a continual movement or circulation of water going on in the system until the whole body of water again comes to an even temperature.

Q. 4—If a good fire is in the heater why should not the water in the system become heated to the same temperature all over and circulation stop?

A.—Because, as described in the previous answer, the water as it becomes heated expands, and becoming lighter in weight is forced upward by the fall of the colder or denser water. The hot water passes upward from the heater through the main flow pipes to the different coils and radiators in the different rooms of the buildings, to which it gives off its heat. The water thus becomes colder and thereby gains in density, which causes it to fall back through the return pipes of the system to the bottom of the heater, where it again obtains heat from the fire. This action continues long after the fire is out, until the water in the whole system is of the same temperature all over, and the same as that of the surrounding atmosphere.

Q. 5—How does the water give off its heat to the several apartments in which the coils and radiators are placed?

A.—The water first imparts its heat to the metal of the coils and radiators, which in turn imparts its heat to the air, which, coming in contact with, and passing over the heated surface of the radiators and coils, then circulates around the several rooms.

Q. 6—If water expands when heated, what becomes of the expansion of water in the hot water heating system?

A.—At the highest point, and above the highest radiator or coil of the system, is placed an expansion tank, which takes up the expansion of water and thus relieves the system of any pressure, with the exception of the natural weight of water. This tank also prevents the waste of water.

Q. 7—Is this tank an open or a closed one?

A.—The better system is the open tank. The tank need not have an open top, all that is necessary being an opening in the top of the tank large enough for a 1¼-inch pipe, which is carried to some convenient point where the water can discharge, should the water in the system expand beyond the capacity of the tank. This pipe leaves the tank open to the atmosphere and thus relieves it of all pressure.

Q. 8—Are closed tank systems ever used?

A.—Yes, but they are not advisable, for one might almost as well put in a steam system as a closed tank hot water system. Besides, should an accident happen to a closed tank system it is liable to cause more damage than an accident to a steam system.

Q. 9—If closed tank systems are not advisable, why are they sometimes used?

A.—They are generally used from two causes. One is when it has been found that the radiators in a system are too small to do the work; the system is then put under pressure. Doing this, one can raise the temperature of the water away above boiling point, and thus make the radiation do its work by heating it to and above the temperature of the steam (212 degrees at atmospheric pressure). The other cause for using it is to produce a cheap first-cost system, as a closed tank hot water system does not require much more radiation than a steam system.

Q. 10—Why is the hot water heating better than steam?

A.—It is a milder and steadier heat. It is better adapted to the many changes of climate we have in this country. It is less liable to accident, requires less repairs than other systems and less attention, and although it is higher in first cost it is less expensive to run than any other system.

Q. 11—Why is it a milder and steadier heat?

A.—It is milder for the reason that one uses a larger quantity of heating surface than in steam, thus giving a larger surface for the air to pass over and heating this surface to a much lower temperature than steam; therefore it is the less liable to overheat the air. It is steadier for the reason that the temperature does not fluctuate so much as in steam.

Q. 12—Why does the temperature not fluctuate so much?

A.—To obtain steam you must raise the water to 212 degrees, and should the fire drop so as not to raise the water to the required temperature you have no steam at all, and radiators as well as the rooms very soon become cold. In a hot water system, should the fire drop, the water will only lower a few degrees, and the radiators never become cold till long after the fire is out, and one seldom neglects their fire enough to let it go out. For this reason you do not get the sudden changes of temperature that you do in a steam system.

Q. 13—Why is it better adapted to the changes of climate?

A.—Because you can use a larger range of temperatures than in the steam system. In mild weather you can circulate your water at from 80 to 100 degrees, and in very cold weather at from 150 to 200 degrees, while with steam you have, as a rule, only a range from 212 degrees to about 227½ degrees, the temperature corresponding to the 5 pounds pressure under which low pressure steam systems are usually operated. Thus, you will see, in a hot water system you have a range from 80 to 200 degrees, or 120 degrees, while in steam you only have from 212 to 227½ degrees, or only 15½ degrees. From this you will see that with hot water systems you can meet almost any change of weather.

Q. 14—Why is it less liable to accident and why does it require less repair and attention?

A.—It is not very liable to accident, being as a rule put in on the open tank system; there is no pressure on it, except the weight of the water. No safety valves are required, and therefore there are none to get out of order and cause accidents. It is almost impossible to drive all the water out of the system and thus burn the boiler. If you were to have all the drafts open and raise a big fire, all you could do would be to boil the water in the system and perhaps cause it to overflow through the overflow pipe at the expansion tank, but you could not blow up or burn the boiler or system. It requires less repairs because there is no pressure on it, no safety valves or water feed, etc., to get out of order. In fact, there is nothing in the system to get out of order, and if properly put in and made light at first it should never require repairs. It requires less attention because a hot water system is run with a banked fire, and requires attention as a rule only night and morning, with perhaps, on a very cold day, a little attention in the middle of the day; and it is controlled by its draft principally, but not by going to it every now and then to put more coal on.

(To be continued.)

The Economy of Small Anthracite Coal.

BY GEO. H. WARD.

The true measure of economy in which the owners of steam plants are most interested is the net cost of the steam used. They care little whether a pound of coal will evaporate six pounds of water or sixty, as long as the results attained are satisfactory from a financial standpoint. The fierce competition of to-day has necessitated on the part of steam users a degree of consideration of the other question of the cost of making steam that was not more than remotely considered a decade ago.

Up to say ten or twelve years ago coal of a smaller size than nut was almost an unknown quantity among steam users. Many engineers contemplated the substitution of pea or buckwheat coal for egg or nut size with about the same aversion that the average man might have for the society of a small-pox patient. An undefined fear existed among many that the caloric value of the coal in smaller sizes was but a fraction of that of the larger sizes, and that, notwithstanding the marked difference in price of the smaller as compared to the larger sizes, they saw no promise of economy in its use, believing that an increased consumption of from 25 to 50 per cent in weight for the same work done would be the result, and assumed that the increased consumption must more than offset the difference in cost price.

Let us analyze this question, and see where if any the economy of burning high price fuel comes in.

As engineers we know that under *average* commercial conditions an evaporation of eight pounds of water per pound of coal will be quite high enough to credit as the evaporative duty of our boilers, and in the following illustration I shall so assume. We will further assume that we have a boiler 72 inches diameter by 18 feet in length, with a grate area of 36 square feet, and that the average daily consumption of fuel is three tons, or 6,720 pounds of Lehigh egg coal, costing $5 per ton net in our coal bunkers. Cost of fuel daily, $15.00.

The weight of water evaporated under the above conditions will therefore be $6,720 \times 8 = 53,760$ pounds; and assuming that our plant is operated eleven hours per day, the weight of fuel burned per square foot of grate surface per hour would be $\frac{6,720}{36 \times 11} = 17$ pounds. The analysis of the same coal in the small sizes will not materially differ from that of the larger sizes, and hence its evaporative duty is about the same; but in deference to the claims of some engineers, usually made by those only who have had little if any experience in the burning of the smaller and cheaper grades of fuel, we will concede it to be 12½ per cent less efficient, and credit the buckwheat coal we propose to substitute for the egg coal with an evaporative efficiency of only 7 pounds of water per pound of coal, all other conditions, such as temperature of feed water, pressure carried on boiler, and grate area remaining unchanged. As before we have 53,760 pounds of water to evaporate into steam at the same pressure, but have assumed the lower duty of but 7 pounds of water evaporated per pound of buckwheat coal, hence our daily consumption will be $\frac{53,760}{7} = 7,680$ pounds or $\frac{7,680}{2,240} = 3.42$ tons, corresponding to an hourly consumption of $\frac{7,680}{36 \times 11} = 19.3$ pounds per square foot of grate surface.

Let us assume we are paying a good stiff price for No. 1 buckwheat coal, say $3 per ton. Our daily consumption, therefore, of 3.42 tons will cost us $3.42 \times \$3 = \$10.26$ per day, which, compared with $15 per day for egg coal for the same duty, means an economy of nearly 33 per cent in favor of the cheaper fuel,—notwithstanding that we have in a measure discriminated against the buckwheat coal by crediting it with an undeserved reputation of evaporating 12½ per cent less water, pound for pound, as compared with egg coal, also a price for the buckwheat coal that is certainly high.

While considering this question I would say there is very little use in attempting to burn the smaller sizes of anthracite without proper preparation. This coal can be burned to most excellent advantage provided the proper means are used. Without a good understanding of the conditions necessary to success, failure is all that can and should be expected.

What these conditions are may be briefly stated as, first, draft; and secondly, manipulation of the fires.

Of course no fire will burn without draft, and the greater the amount of fire in a given space the stronger the draft must be to properly consume the fuel. With the larger sizes of fuel this question of draft is less prominent, but when we come to burn the smaller sizes the draft is of the utmost importance.

The small coal will pack on the grate, and owing to the way the pieces will arrange themselves one to another it will be impossible to get sufficient air through the bed of fire unless the draft is strong enough to displace the smaller particles, or, to use a homely phrase, to make the fire "dance." Another and perhaps a better reason is that the proportion of ash is somewhat greater with the smaller coals, and as the fire is but a thin crust on top of this it follows that a somewhat stronger draft will be required to get the necessary volume of air through this bed of ashes and the closely packed crust of fire on top.

As the modern tendency to forcing fires has proved to be economical, and the amount of coal burned per square foot of grate surface per hour has been largely increased in the past few years, with most beneficial results, it will not be amiss to state that the subject of draft has received a large share of attention, and that most of the more modern plants are well provided in this respect.

Some of the older plants may be very deficient in draft, but any one who has not looked well into the subject would be greatly surprised to know how small a matter it is to remedy very many cases. Flues that are too small or too crooked are very common; dampers in the uptake that obstruct and deflect the gases; top return on boilers that can be only cleaned by tearing down the brickwork; these and other similar causes will readily suggest to any observant man the remedy.

In relatively few cases is the trouble due to the chimney, a small outlay in the majority of cases will give sufficient draft to burn coal as small as No. 2 buckwheat without using any mechanical methods.

In the manipulation of the fires the first requisite is a man who will not cover them too thickly at any one time, who will not permit them to burn black in spots, and who will keep them level. As before stated, the fire is a "crust," which must not be broken, therefore a slice bar is a tool to be kept away from these fires. A shaking or rocking grate must *not* be used, as either of these will break through the fire and mix ashes and fire in a hopeless mess. A dumping bar is all that can be used to advantage, and the ease and rapidity with which a fire can be cleaned with these bars make them a necessity. A fire cleaned on a dumping bar is an absolutely *clean* fire, and the very slight reduction in steam pressure (due to the cleaning) is rapidly caught up with again, owing to the quick combustion of the small coal.

Clean fires are certainly the cheapest and easiest to handle, and with the coal in question are the only fires permissible.

When the fires get to about six (never more than eight) inches in depth they must be cleaned; any coal burned in a greater depth means waste, and the sooner the cleaning is done the better.

The economy of the coal consists in its low cost and its perfect combustion.

It is safe to say that for the same work done no more of it will be burned than of the larger coal; and in a number of cases coming under the writer's notice much less was burned than of egg coal. Coal in the smaller sizes presents a large number of small faces to the fire and is thoroughly consumed.

Again, in the mining it is generally the hardest and best coal that breaks so fine, and a better quality is assured in the smaller sizes. To any one who will once try the smaller coal I will say that after becoming familiar with the methods of using it, as herein recom-

*A paper read before the Engineers' Club of Brooklyn, N. Y.

mended, you would not go back to the larger coal unless it were given to you.

To clean a fire in the ordinary manner with any coal is a hot and odious process. To begin, the fire must be burned down to a point at which it can be handled without roasting the man who cleans, and this burning down is a beginning of that loss of pressure which lasts for some time after the job is done and the fire covered. No matter how the cleaning is done—with the stationary bar, it is impossible to do it right.

To haul a dirty back over a clean front is simply spoiling the front without helping the back of the fire to any extent. If the fire is "winged" i. e., cleaned first on one side all the way back and then on the other, there is more or less mixture of the fire and ashes at the centre line which cannot be avoided. With a dumping bar the fire can be "burned up" to any point desired, as the first operation is to push the fire *back* from the front section on to the rear section. The front section is then dumped, whatever ashes may be on the bars are dumped into the ash pan, and the ash pan doors being closed, no dirt is thrown out into the fire-room. The bars are then throw back, and will be found to be absolutely clean.

The fire is then pulled on to the front section and the back section dumped, after which the fire is spread and covered. There is no heap of hot ashes (with these bars) piled right in front of the fireman's face, as all of the ashes are in the ash pan below, where they can be removed at leisure.

The writer has seen furnaces six by six feet cleaned in three minutes without any extra exertion on the part of the fireman, and with a reduction of pressure of not more than five pounds. The short time that the doors are open to clean makes the brickwork last much longer, and is certainly more beneficial to the boiler itself. There is no dust or dirt thrown into the fire-room, and the men can clean twice the number of fires possible with the stationary bar. With dumping bars there is every opportunity to burn the small coal to the best advantage, and no excuse for dirty fires. Again, in a great many establishments one boiler is kept under steam, with a fire on the "bank" just to help out, for perhaps an hour or two of maximum load.

It will require as much coal to pull the fire down, raise pressure, and bank again after use, as would run that boiler half a day. It so happens that the heavy load comes just at the close of the day, when the fires are dirty.

This is true of large office buildings, mills, etc., which have a large electrical installation, or fan blowers for foundries. It is only for an hour or two in the evening that a heavy load is thrown on, but it comes at a bad time, and so the extra boiler has to be fired up and thrown in.

In such places the dumping bars can easily carry the load, by cleaning the flues just before the time the demand is made for steam. It is then no trick to force a boiler with clean fires. The fires can be let out of the extra boiler, thus saving coal. The economy in using dumping bars consists in the ease with which the fires may be cleaned, thus keeping the boilers always at their best efficiency. With these bars an increase of power may be obtained anywhere from 10 to 25 per cent by using ordinary judgment with the fires.

Regarding the advantages of the dumping type of bar, I would here say the following reasons present themselves: (1) The thoroughness with which a fire is cleaned. (2) The quickness with which it is done. (3) The gain in time in which the fires are caught up again, and the boiler making steam. (4) The marked economy shown, no coal being wasted by being shaken through the grates, which result is unavoidable where bars of that type are used and coal of smaller size than nut burned upon them. Moral, inspect your ashes. (5) A more nearly uniform temperature of furnace, which in itself is conducive to economy. (6) A material economy in the item of maintenance of side walls, bridge walls, arch plates, and dead plates, they not being damaged by the use of slice bars, hoes, or other fire tools. (7) Freedom from dust and hot cinders. (8) Lessened fire risk. (9) They will return good interest on amount invested. (10) Last, but not least, increased comfort for engineers and firemen.

A raising of the evaporation from 6½ to 7 pounds of water per pound of coal represents the saving of about 7 per cent of the coal bill, which would warrant the incurrence of an expenditure for improvements equal to one whole year's coal bill.

An improved system of ventilation has been introduced in the great hall of the new Sorbonne, in Paris, the principle resorted to being that of maintaining the walls at a higher temperature than that of the air which they enclose. In order to accomplish this (says one of our contemporaries), a mixing chamber is located beneath the auditorium, and hot and cold air are mixed to the temperature desired; the air is forced into the auditorium through a great number of small holes in the floor and in front of the seats, the openings being covered by a wire netting. Before the entrance of an audience, the walls are thoroughly warmed by forcing air heated to 200 degrees into a conduit, which delivers the air into a space behind the molding and close to the floor. The wall is thus heated to a temperature of 100 degrees—a temperature which, by radiation, will keep the audience comfortable, at the same time ventilating the hall with air at sixty degrees, derived from the mixing chamber. All downward cold drafts are thus prevented, the currents of air all being upward, owing to the heated surface.

Soldering Without Heat.

Soldering without heat, commonly called cold soldering, is a process not only possible but common, and, after the first preparation, is exceedingly simple, says the Manufacturer and Builder. The process given has many uses for soldering all articles which cannot be exposed to heat and for soldering parts together which cannot be got at with either a copper bit or a blow-pipe flame. The process of cold soldering can be extended even to soldering two faces of dirty cast iron together. It may be done on blocks of any size withou the slightest assistance, so far as heating is concerned, by the following process: Although the first preparation is tedious, a large quantity of the materials can be made at once, and the actual soldering process is simple and quick.

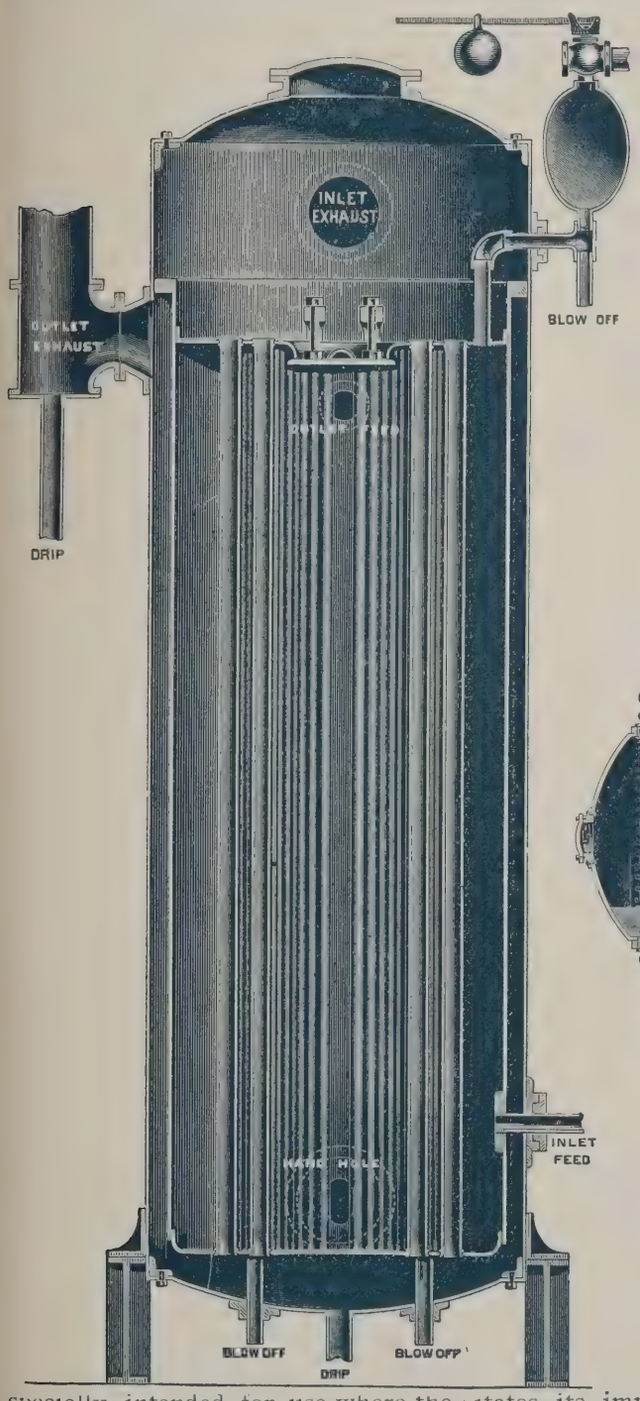
Flux: 1 part metallic sodium to 50 or 60 parts mercury. This must be kept in a stoppered bottle, closed from the air. It has the property of amalgamating (equivalent to tinning by heat) any metallic surface, cast iron included. Metallic sodium alloys with mercury by cautiously triturating the materials in small quantities at a time, in a Wedgewood mortar. If it be too much trouble to make it, the sodium amalgam can be bought ready made from any chemist or dealer in reagents.

Solder: Make a weak solution of sulphate of copper (about 10 ounces to 1 quart of water). Precipitate the copper by rods of zinc; wash the precipitate two or three times with hot water; drain the water off, and add for every 3 ounces of precipitate 6 ounces or 7 ounces of mercury; add also a little sulphuric acid, to assist the combination of the two metals. The finely divided copper combines with the mercury, and they form a paste, which sets intensely hard in a few hours; and, while soft, this paste should be made into small pellets, which harden, and has the property of softening by heat and again hardening in a few hours. When wanted for use, heat one or more of the pellets until the mercury oozes out from the surface in small beads, shake or wipe these off, and rub the pellet into a soft paste in a small mortar, or by any other convenient means, until it is as smooth and soft as painters' white lead. This, when put on the surface, amalgamated by the sodium and mercury, adheres firmly and sets perfectly hard in about three hours. The joint can be parted, if necessary, either by a hammer and cold chisel or by a heat about sufficient to melt plumbers' solder.

Before entering a boiler that has been standing idle for any length of time, every engineer should take precautions to see that the boiler is clear of gas, or the fumes of any material the boiler may have been painted with in laying it up.

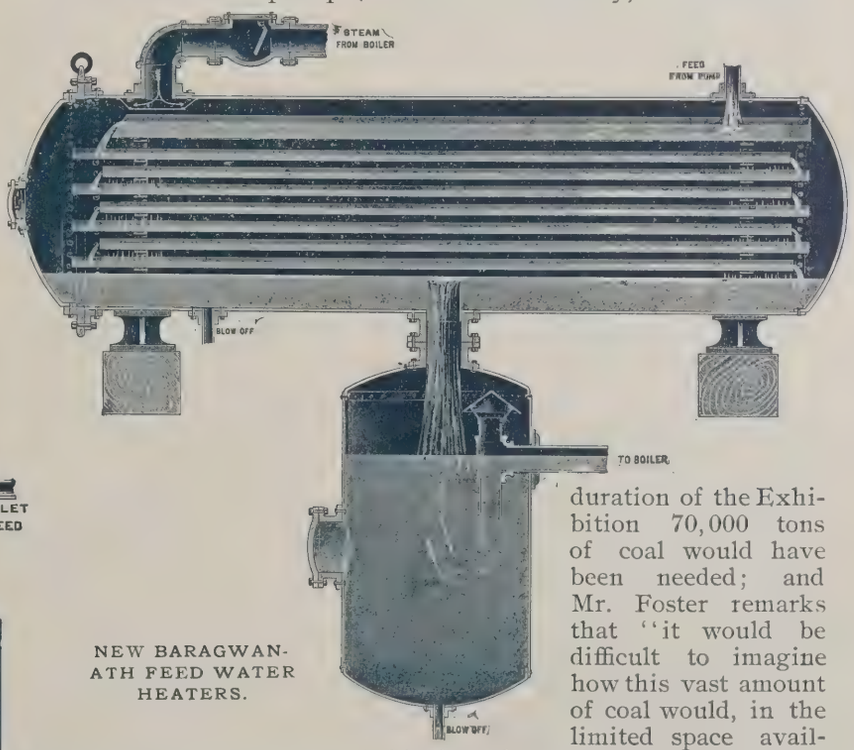
New Baragwanath Feed Water Heaters.

Some new feed water heating and purifying apparatus recently brought out by Wm. Baragwanath & Son, 48-52 W. Division street, Chicago, are illustrated herewith. They embody several points of improvement over the older apparatus for the same purpose so well known in connection with the firm's name. The steam-jacketed upright heater is made in large sizes, 500 horse-power and upward. It is provided with a manhole at the center of the tubes, so that every part of the interior is rendered accessible. It is



specially intended for use where the feed water is very hard and the liability of the tubes to scale is consequently great. The water enters at the right near the bottom, circulates around and between the steam tubes, and passes out through the outlet near the top. The water chamber is provided with blow-offs at top and bottom, a scum chamber, and a safety valve. The exhaust steam enters near the top, passes down through the tubes in the water chamber, and up around the outside, acting as a complete steam jacket for the water chamber. In the horizontal heater live steam is used, it being termed a feed water "superheater" as well as a purifier. It is not designed to do away with the exhaust steam heater, but rather to act as an auxiliary to it in certain cases, as, for instance, where the heater is inadequate to do the work, where water is used which contains impurities that cannot be removed by boiling, or where no exhaust is available. Briefly stated, it heats the water up to the temperature of that in the boiler, and precipitates the scale on readily accessible and removable shelves before passing the water into the boiler at all. It consists of a heavy boiler iron shell, with removable heads, and contains a series of slightly inclined shelves or pans over which the water flows in direct contact with the live steam from the boiler. The water is heated to nearly the same temperature as that in the boiler, and when thus heated precipitates its impurities in the form of scale on the shelves. After thus flowing backward and forward the full length of the superheater several times, the water falls to the bottom of the superheater, which is arranged to act as a settling chamber and retain the heavier particles of scale, mud, or sand which may be carried over the shelves by the flow of water. The water then flows into the lower settling chamber, which is so arranged that the water is drawn from a point half way between the surface and the bottom, thus retaining both the scum and any mud which may have passed through the first settling chamber. Suitable blow-offs and hand-plates are provided.

The heads are provided with nozzles through which the interior may be easily examined. When the shelves have become coated with scale so as to interfere with the flow of water, the heads are taken off and the shelves drawn out and cleaned. The bottom and the settling chamber should be washed out at the same time.



NEW BARAGWANATH FEED WATER HEATERS.

Oil fuel at the World's Fair is the subject of a recent report by Chas. F. Foster to the Standard Oil Co. During the period the Exhibition remained open, the main boiler plant consumed 10,614,401 gallons, or 74,300,805 pounds of oil for generating steam; developing the aggregate energy of 32,315,964 horse-power hours, at a cost of 6.3 mills per horse-power hour. The cont act price for the oil delivered in the Exhibition tanks was 72½ cents per barrel of 42 United States standard gallons. The boiler house force and equipment comprised 210 burners, atomizing oil beneath 52 boilers with a standard rating of about 21,000 horse-power, and attended by a staff of 42 men, divided into three eight-hour shifts. An equivalent consumption of from 500 to 600 tons of coal per day would have been necessary, so that for the duration of the Exhibition 70,000 tons of coal would have been needed; and Mr. Foster remarks that "it would be difficult to imagine how this vast amount of coal would, in the limited space available, have been handled expeditiously and without endangering life and property. The saving to the Exhibition by the use of oil fuel was about 27 per cent as compared with the estimated cost of coal, including the labor of handling. The oil plant worked from start to finish without a break, and the smokelessness and absence of odor from the chimneys of the boiler house were a subject of general comment.

New Methods of Heating.

The accompanying illustrations present some of the new ideas which have been embodied in the heating apparatus that is being introduced by the Paul Steam System Company, of Boston, who control all of the patents under which the apparatus is manufactured. The system shown by Fig. 1 is the invention of William P. Skillington, of New York, the improved method of heating consisting in supplying steam in measured quantities, at or below atmospheric pressure, and maintaining a positive circulation by reducing the pressure, or in other words creating a partial vacuum by the removal of air, at the point where the steam is used. By this means the amount of heat given off by the radiating surface can be regulated more accurately and between wider limits than in the ordinary steam heating apparatus, for by reducing the pressure at the point where the steam is used, the steam may be so expanded and the number of heat units contained in it may thus be so reduced as to supply a less degree of heat to the air of the apartment, whereas in the ordinary systems of steam heating, if the radiator is used at all, the heat given off by it can be changed only within narrow limits and then mainly by varying the pressure of the steam at the boiler or other source of supply. The radiators shown by Fig. 1 are arranged on the double pipe system, and in the supply pipe to each of them is placed a reducing valve which is supplemental to the reducing valve that, as shown, is placed in the main supply pipe. These supplemental reducing valves enable the radiators to be operated under different pressures, so that they would tend to heat the rooms in which they are placed to different temperatures, but it is obvious that they might be omitted, and the pressure

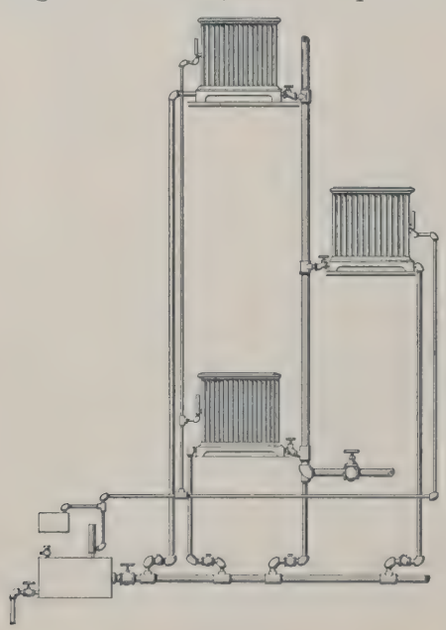


FIG. 1.

in the system controlled simply by the reducing valve in the main supply pipe. The automatic air valves, which permit the escape of air from the radiators, but prevent the exhaustion of the steam, are connected to a positive air exhauster, which is located just above the tank, shown in the lower left hand corner of Fig. 1, in which collects the water of condensation from the vertical return pipes, each of which is provided with a check valve near its lower end, just above where it connects with the main return. These check valves, while permitting the escape of the water of condensation, serve to prevent the return of any steam or air in the contrary direction. The operation of the system is as follows: At the same time that steam is admitted the exhauster is put into operation, and the air is removed from the system. The steam quickly flows into the radiators, and on reaching the automatic air valves closes them. The system is then full of steam at a pressure just equal to or less than that of the atmosphere, so that with the condensation of the steam there is a consequent reduction of pressure in the radiator, more steam flowing in to take the place of that which is condensed, the water of condensation

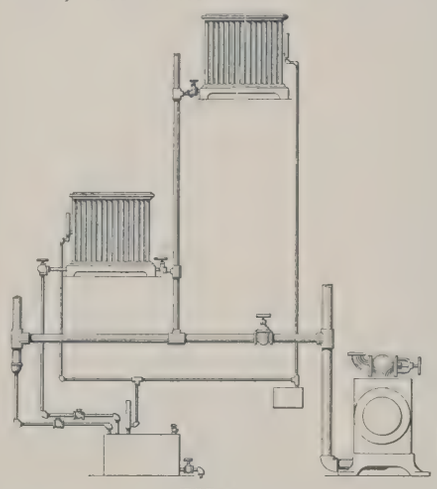


FIG. 2.

flowing into the collecting tank, which, as shown, is connected to the air exhauster and is provided with two pet-cocks, through one of which it is necessary to admit air in order that the water may be drawn off through the other. The above described method of heating as applied for utilizing the exhaust steam from engines is shown in Fig. 2, where it will be noticed that the upper radiator is connected up on the single pipe system, the other being arranged on the double plan.

The heating system shown by Fig. 3 is the invention of Andrew G. Paul, of Boston, and consists of a source of heat, such as a kitchen range, between which and the circulatory system of pipes and radiators is arranged an intervening heating medium of such a nature that it cannot be heated above a limited degree, a positive air exhauster being connected to the system for the removal of air. The cut shows a regular kitchen boiler connected with the range water-back in the usual manner. Supposing that the heating agent to be employed is steam, the generating coil within the kitchen boiler is filled with such an amount of water as will produce a sufficient quantity of steam to fill the system and convey the necessary amount of heat to accomplish the work for which the system is designed. A larger quantity of water is employed

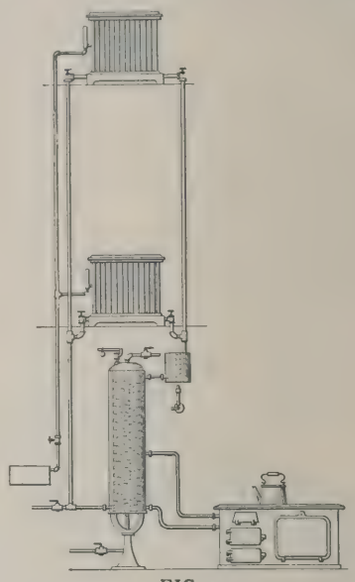


FIG. 3.

than would be necessary to furnish the requisite amount of steam at the required temperature and pressure if all the water was evaporated, for the reason that the water will ordinarily not all be turned into steam at any one time. Air is then exhausted from the system by means of the air exhauster shown at the left of the cut, the automatic air valves on the radiators operating to prevent the escape of steam. The intervening heating medium in this instance is the water in the boiler, and it is evident that it can impart to the water in the heating system only a limited amount of heat, its usual temperature under atmospheric pressure being 212 degrees F. The exhaustion of the air from the system causes the pressure upon the water in the coil within the boiler to be reduced to a point below atmospheric pressure, by reason of which reduction the water in the coil will boil at a temperature less than 212 degrees F., the particular temperature at which it will boil depending upon the extent to which the pressure in the system has been reduced; but in any case the system will be filled with steam of less than atmospheric pressure, the automatic air valves will close to prevent the loss of steam, and the water of condensation will flow from the radiators through the return pipe back to the generating coil within the kitchen boiler, to be again heated, turned into steam, and circulated through the system, the circulation being effected, of course, by the condensation of steam in the radiators. As there will be some slight waste of steam from time to time, a small quantity of water is occasionally added to that already in the system. When the boiler and range are not in use, or when the water in the boiler is not sufficiently hot, the gas jet shown may be used for securing such additional heat as may be required.

New Line of Heating Boilers.

The accompanying cuts show a new line of house heating boilers, which are being placed on the market by the

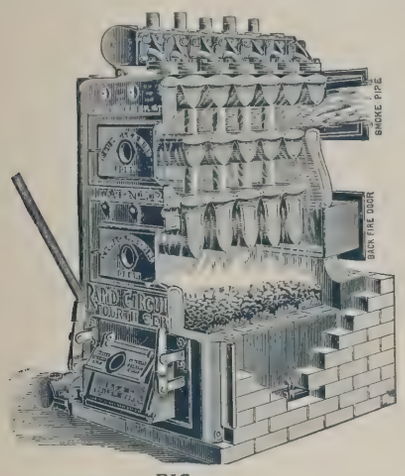


FIG. 1.

Rapid Circulator & Columbian Boiler Works, of Oneida, N. Y. The rapid cicrulator, a sectional view of which is shown by Fig. 1, is made under five separate patents in a large variety of styles and sizes. As shown, the course of the products of combustion is upward, the circulation of the water being vertical. The boiler may

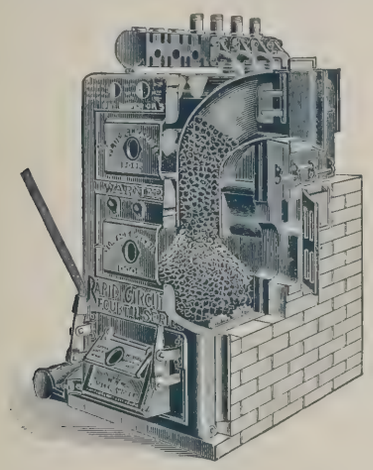


FIG. 2.

be constructed with one fire pot, as shown by Fig. 3, Fig. 2 showing the application of a magazine feed. The boiler is made in sections, each of which is independent of the others, so that in reality each section has all the elements of an entire boiler in itself. If the boiler proves too small,

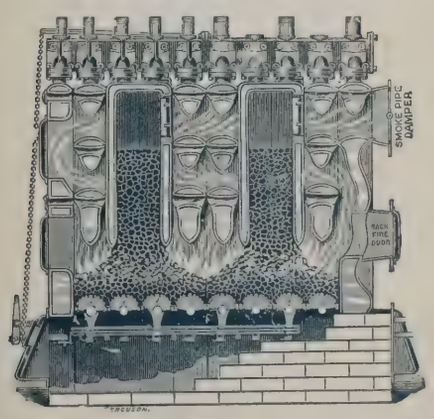


FIG. 3.

after it has been placed in position, its size may be increased by taking out four bolts, removing the back section, and adding as many intermediate sections as may be required. In setting up the boiler, connection with the steam and return drums is made by an entirely new device called a rapid adjustable coupling. The sections are simply bolted together and then with a movement of the coupling, either up, down, or sideways, the connection is easily and quickly made.

The boiler is fitted with a superior shaking grate, which is simple in adjustment and in operation. It will be sold in sections so that the dealer or fitter can build up a boiler of any size with either a single or double fire chamber, for surface or reservoir feeding. They are desinged to be inclosed in one course of

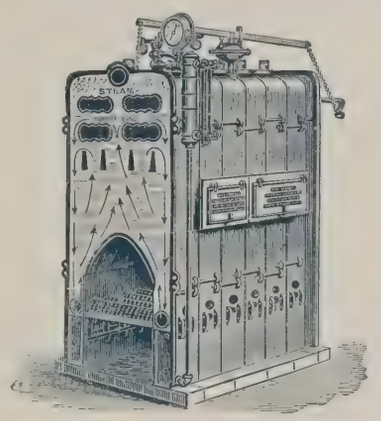


FIG. 4.

brickwork on two sides and back, but when desired, may be covered by asbestos.

The Columbian boiler, end and side sectional views of which are shown by Figs. 4 and 5, is designed for either steam or hot water heating, portable or brick-set, and in the main is similar to the rapid circulator, the essentional points of difference being in the disposal of the ex-

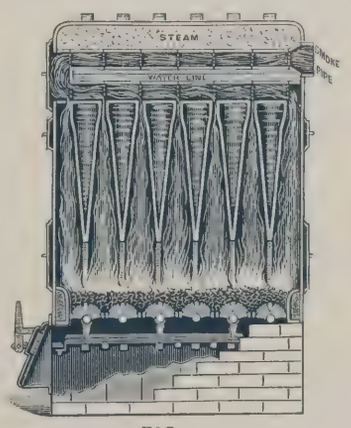


FIG. 5.

posed water surface, and the internal arrangements for directing the course of the products of combustion, and that the Columbian is connected up without drums at either top or bottom.

It will be seen by reference to the cuts that when used for steam the water chambers are almost wholly within the direct rays of the fire, while the shape of the water sections is such as to insure a rapid circulation. The front and back of the boiler are simple enclosures for the products of combustion, thus insulating the water chambers from exposure to the atmosphere. The bottom of the ash pit is left open so that the boiler may be set over a cheaply constructed ash vault, or sunk below the

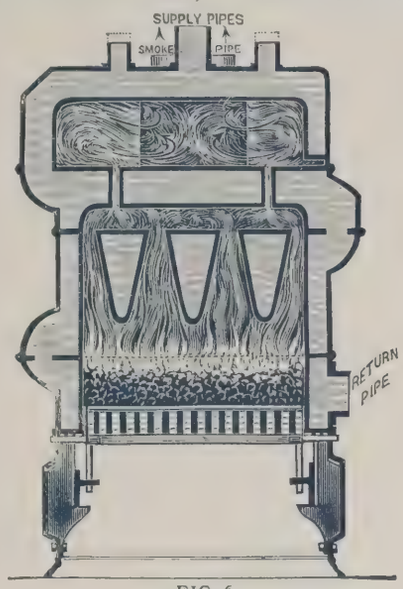


FIG. 6.

bottom of the cellar, without interference with its working.

The Scientific boiler differs entirely from the two boilers just described, though it is provided with the same grate, shaking attachments, etc., but is not made up in sectional form. It is made in five sizes, each of which has a base of its own, put together complete before shipment. The boiler is made low and compact, and is of the ''cottage'' form. The manufacturers claim that they nearly double the heating capacity of the boiler by the introduction of water chambers directly over the fire, thus largely increasing the fire surface. The circulation of water is from side to side in its upward course, passing and repassing over the fire at each section, making the Scientific an economical and powerful heater for this description of boiler. Figs. 6 and 7 are end and side sectional views, showing the Scientific as a hot water boiler, but it is also designed for steam. Hard or soft coal may be

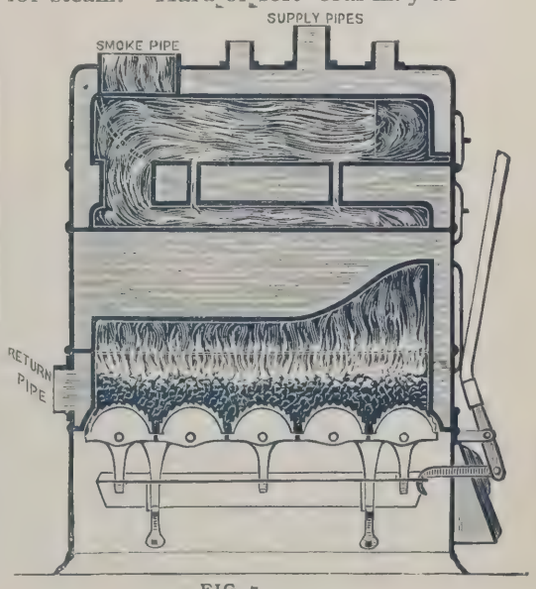


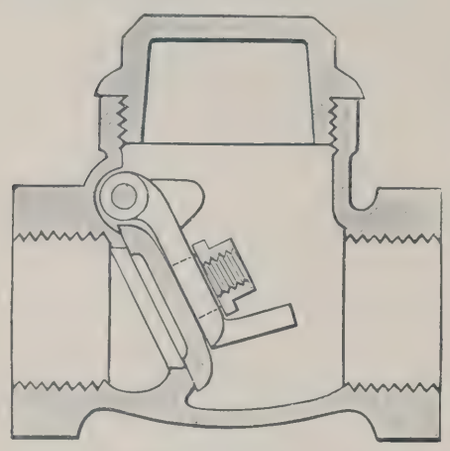
FIG. 7.

used for fuel, but when soft coal is used the boiler should be cleaned out frequently.

NEW SPECIALTIES.

KENNEDY CHECK VALVE.

The straightway swinging check valve shown by the accompanying cut is manufactured in brass and iron by the Kennedy Valve Mfg. Co., 52 Cliff street, New York. The disks in both the brass and iron valves rotate, and are so constructed that they cannot become inoperaive by sticking fast in the body of the valve when in use. The boxes in which the disks hinge are made of the best bronze. Valves above 8 inches are furnished with a by pass when required, all valves being made either with screw,

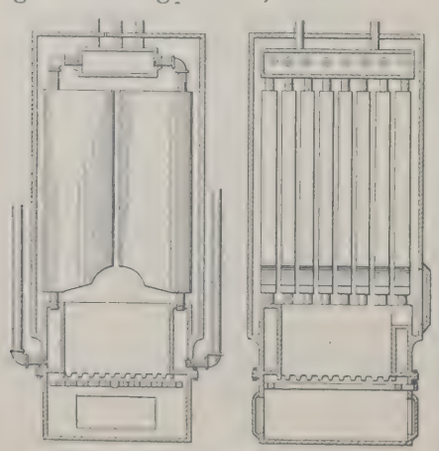


KENNEDY CHECK VALVE.

flanged or bell ends and brass, leather or rubber disks as required.

THE LAING HOT WATER HEATER.

The fire pot of this heater is provided with an outstanding lateral flange, which serves to support the casing or shell, within which is arranged, in two parallel series, a nest of water chambers, as shown. The fire pot is surrounded by a water jacket into which the return pipes on each side of the heater discharge. Each of the sections is connected with a reservoir or distributing chamber at the top, from which the flow pipes are taken, the products of combustion circulating freely around and between the water chambers, in which the heated water has a vertical circulation. It will be seen that the construction is very simple, ample provision being made for readily cleaning the heating surface, which is ex-



LAING HOT WATER HEATER.

posed to the direct action of the fire. J. M. Laing, of Bay City, Mich., is the inventor and manufacturer.

PAUL DRYING CYLINDER.

This device is the invention of Andrew G. Paul, and is manufactured by the Paul Steam System Co., of Boston, Mass. The object of this in-

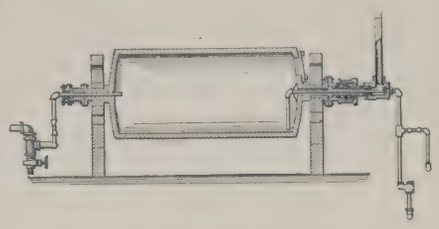


FIG. 1.

vention is to supply a positive means of removing from steam drying cylinders the water of condensation, to counteract the effect of which it has been necessary heretofore to employ a larger number of cylinders than would suffice to do the work could it be positively removed. The discharge pipe, which passes through the journal of the cylinder and through the steam supply pipe, as shown in Fig. 1, is provided with a check valve having a regulating device, Fig. 2, by which it may be set to prevent the discharge of more than a given quantity of water. An escape pipe is connected to the discharge pipe, as shown, the air pipe passing into the cylinder at the left being provided for removing the air. The quantity of air removed is limited by the restricted passage in the air pipe, which is connected to a positive air exhauster. In starting up, this air exhauster removes the air from the cylinder, and as soon as the water of condensation seals the discharge pipe,

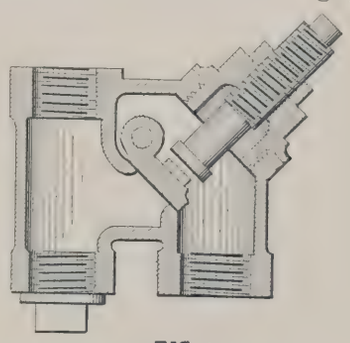
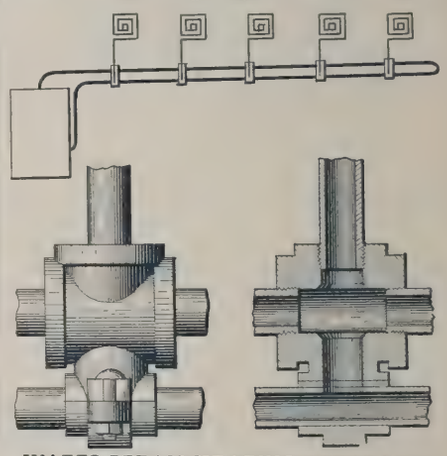


FIG. 2.

the action of the exhauster of the escape pipe causes the discharge of the water in a manner which will be readily understood from an examination of the cuts.

WATTS STEAM HEATING APPARATUS.

The accompanying illustration shows a new steam heating apparatus recently patented by Elias Watts, of Keyport, N. J. The object of the invention is to provide a means whereby the water of condensation may be returned to the boiler by a direct route without flowing through the steam supply pipe and thereby cooling it, returning the water to the boiler before it has reached a temperature sufficiently low to detract materially from the temperature of the boiler. The upper of the three views shows the application of the device, which is shown in elevation at the left, and in section at the right. The device consists of a four-way coupling of which the aligned lateral arms are connected to the parts or sections of the steam supply pipe, the upper arm being connected directly to the radiator, while to the lower arm is fastened the return pipe, into which the water of condensation passes through an opening vertically beneath that of the upper or radiator arm of the coupling. The return is held in place by means of a cap secured by bolts, as shown by the view at the left, a steam tight joint between the return pipe and the coupling being secured by the use of a rubber or other gasket. The inventor states that by the form of coupling above described

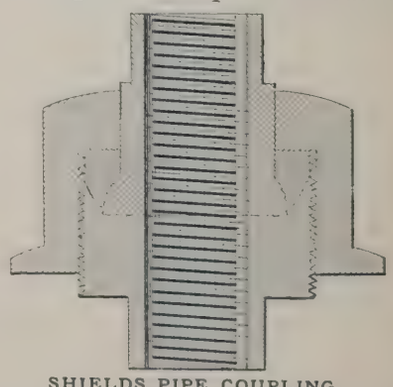


WATTS STEAM HEATING APPARATUS.

he is enabled to employ a continuous return pipe, thereby avoiding the use of unions in connection with couplings; although it will be understood that when preferable unions may be employed for the attachment of the extremities of the return pipe sections. As the cuts are very plain, the operation of the system will be clearly understood without further description. E. Watts & Son, Keyport, N. J., are the manufacturers.

SHIELDS PIPE COUPLING.

The coupling shown by the accompanying cut consists of a male section having a flange with an inclined edge and flat face, and a female section cupped out to receive the male section, and having a flat face, the construction being such that it comes in contact with the male section, outside the body of which is arranged a soft metal packing ring, having a tapering edge, a nut being provided for forcing the packing between the inner edge of the cup and the outward

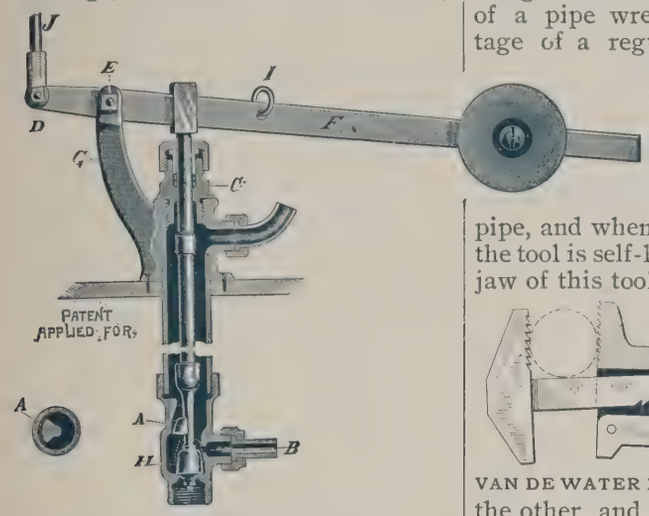


SHIELDS PIPE COUPLING.

edge of the flange. C. Shields, 731 Pierce street, Philadelphia, is the inventor and manufacturer.

THE CASLER FROST PROOF VALVE.

The accompanying cut shows a new water closet valve which is being placed on the market by Casler & Hastings, 360 Seneca street, Buffalo,

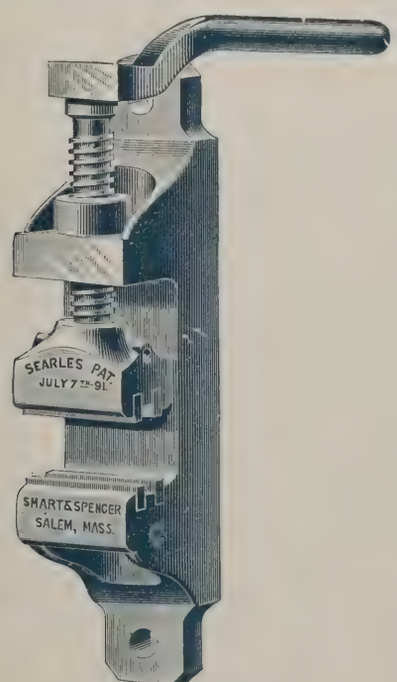


CASLER FROST PROOF VALVE

N. Y. The valve may be operated by the downward bearing rod *J*, or by a chain attached to the ring *I*. The water supply is through the bottom of the valve chamber, the action of the device being such that when the "Fuller" ball *H* is raised, thus opening the supply, the wedge *A* presses it tightly against and closes the waste opening *B*. When the waste is closed the inlet is open, and vice versa.

SEARLE'S PIPE VISE.

The body of the vise shown by the accompanying cut is of cast iron, the screw and the four gripping jaws being of steel. The jaws are reversible and may be readily sharpened when they beome dull from constant use, or they may be renewed at a slight cost. The jaws are diametrically opposite, so that the strain on them is equal, a slight pressure serving to grip and hold the smoothest pipe without in-

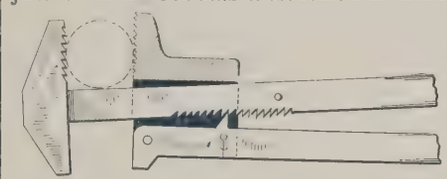


SEARLE'S PIPE VISE.

jury. The vise is simple, and is easily carried with other tools. Smart & Spencer, Salem, Mass., manufacturers.

VAN DE WATER PIPE AND NUT WRENCH.

The inventor and manufacturer of this wrench, Charles Van De Water, Auburn, N. Y., states that it was designed to combine all the qualities of a pipe wrench with the advantage of a regular nut wrench, gripping without loss of motion and releasing readily. Pipe may be turned in either direction without releasing the wrench from the pipe, and when used as a nut wrench the tool is self-locking. The stationary jaw of this tool has a notched handle,

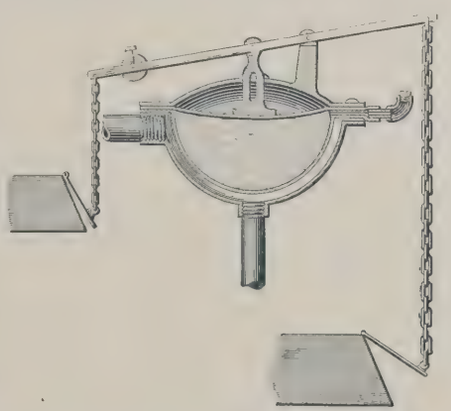


VAN DE WATER PIPE AND NUT WRENCH.

the other and movable jaw having pivoted to it a lever provided with a lug, which acts as a fulcrum when the device is used as a pipe wrench, serving to hold the jaws in a parallel position when it is used as a nut wrench.

LAWLER HOT WATER REGULATOR.

This device for automatically controlling the draft doors of hot water

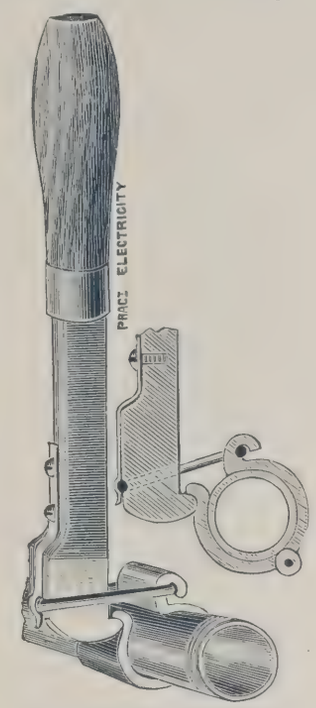


LAWLER HOT WATER REGULATOR.

boilers consists of two hemispherical chambers, in the outer one of which provision is made for circulating hot water direct from the boiler, the inner one containing a liquid whose expansion acts to operate the dampers. When the temperature of the water in the heater rises above the boiling point of the liquid in the inner chamber, the movement of the diaphragm in the upper part of the chamber, caused by the expansion or evaporation of the liquid, is communicated by a piston to the lever carrying the chains to which he draft dampers are attached. The regulator may be made to operate at any temperature by using a suitable liquid in the inner chamber. The operation of the regulator will be clearly understood without further explanation by examining the accompanying cut, which shows that it is simple in construction. The Scranton Steam & Hot Water Boiler Company, of Scranton, Pa., are the manufacturers.

HAYDEN PIPE WRENCH.

This tool is made from forged steel, and is manufactured by the Belden Machine Co., New Haven, Conn., who claim that it is the only wrench

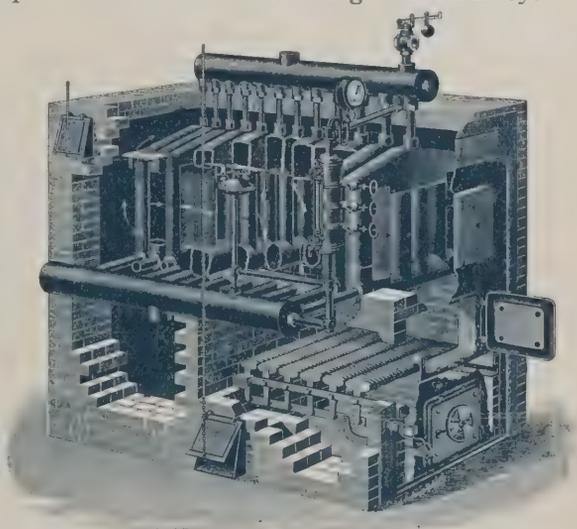


HAYDEN PIPE WRENCH.

on the market which will not mark or crush the pipe when in use. It can be ratcheted the same as any wrench, the manner in which it is used in connection with the clamp being clearly shown by the accompanying cut. It is made in two sizes, by which pipe from ½ to 2 inches in diameter can be easily handled.

SLOTEMAN COMBINATION FLUE BOILER.

The sections of this cast iron boiler are connected by nipples at the top and bottom and connected to the steam and feed drums with lock nuts. Each section is independent of the others and complete in itself. The tubes are vertical, and the gases pass to the rear through the center, returning to the front through the side flues. The gases then pass over the top and side, dropping to the under sections and thus passing the coldest part of the boiler before entering the chimney.

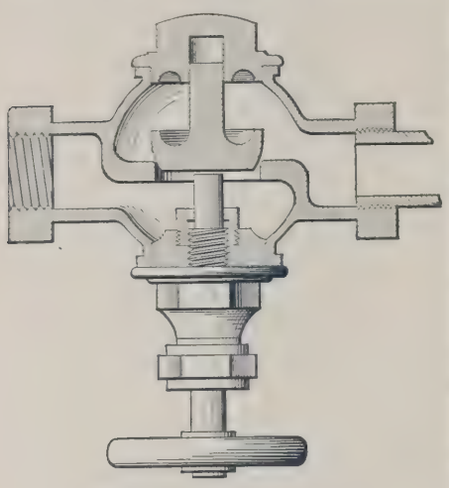


SLOTEMAN COMBINATION FLUE BOILER.

The flues are readily accessible and easily cleaned. O. T. Sloteman, 86 Maple st., Buffalo, N. Y., manufacturer.

TINLEY'S CHECK VALVE

The disks of some of the check valves in branch pipes leading to the different boilers of a battery sometimes stick in their seats with greater tenacity than others, from various causes, such as corrosion, incrustation, or unequal expansion, so that one or more of the boilers may receive more of the feed water than others, or in filling them before firing up, some may remain empty while others are full. To prevent the possibility of such action the check valve shown herewith has been devised by James F. Tinley, of West New York (Guttenburg post-office), N. J. The construction will readily be understood



TINLEY'S CHECK VALVE.

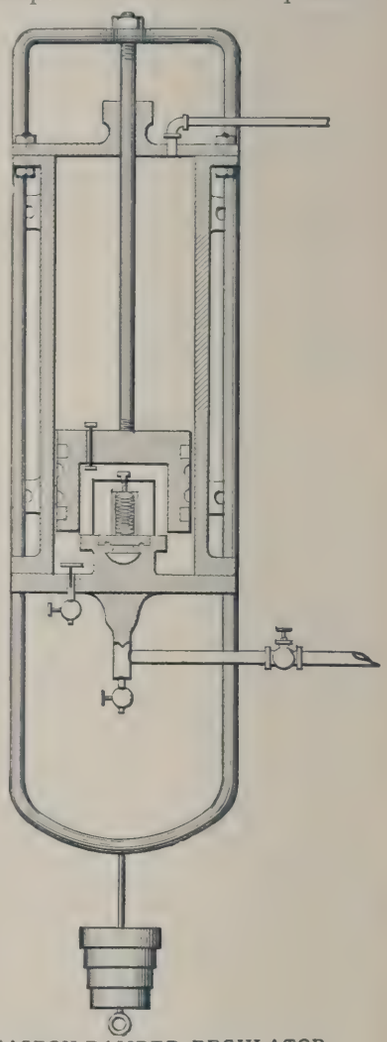
from the cut. The valve stem is winged, and slides in a guide in the cap. The vertical movement of the hand wheel stem is limited to a fraction of an inch by a check nut in the bushing. In operation, when the pump is started, the check valves are lifted from their seats by a turn of the hand wheels, so that all the boilers receive the feed equally, and a reverse turn of the wheels leave the valves ready to act as usual.

COCHRANE EXHAUST FEED WATER HEATER AND PURIFIER.

In the Cochrane heater the water to be heated is brought into direct contact with the steam. Entering at the top of the heater, the water passes over a series of trays, thereby becoming finely subdivided or converted into spray, so that it readily takes up or absorbs the heat of the exhaust steam, which passes upward in a direction opposite to the flow of water and passes out at the top of the heater. Some recent improvements in this type of heater are shown in the accompanying cuts. The details of construction of the heater are shown in Fig. 1. It is made of cast metal, and is equipped with an oil and grease separator, trays for spraying the entering feed water, a float connected to a balance regulating valve which controls the water supply; an overflow, skimmer, hood, and water seals for the drip from the separator and the overflow; and an interior water seal for the water supply pipe. Fig. 2 shows the arrangement of the heater and purifier, which is of the same general design as the heater, but of greater capacity, and provided with a lower shelf for holding coke or other material to give additional depositing surface, and with openings for handling such materials. The manufacturers are the Harrison Safety Boiler Works, Philadelphia, Pa. The hand holes and cleaning doors are conveniently placed, and so arranged that they offer easy access to all parts of the heater, being easily and quickly removed and replaced. The cold water supply pipe inside of heater can be easily removed; while the float and attachments, by taking off the float flange, can be readily examined.

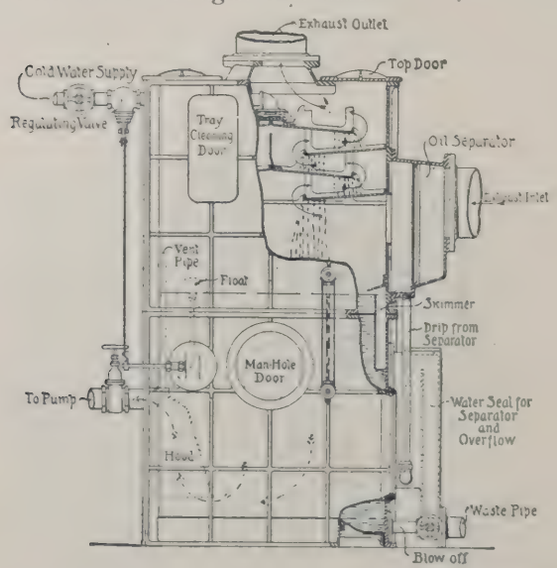
GASTON'S AUTOMATIC DAMPER REGULATOR.

The main part of this device is a steam cylinder with lugs for securing it to a support. In the cylinder is a cup-shaped single acting piston provided with a relief valve and with suitable packing rings and water grooves. The piston rod passes through the upper cylinder head and is connected to a weighted yoke, from the lower end of which a chain leads over suitable guide pulleys to the damper. In the lower cylinder head is an automatic drain valve and a pop valve, connected by pipe with the boiler. The peculiar shape of the piston enables it to fit closely down over the pop valve, thereby reducing clearance. At the top of the cylinder is a relief pipe open to the atmosphere. In operation, when the steam in the boiler reaches the pressure for which the pop-valve is set, the latter will be raised from its seat, and the steam will raise the piston, thereby closing the damper until the fall of pressure



GASTON DAMPER REGULATOR.

in the boiler permits the pop valve to close, the piston descends, and the damper again opens. This action may be regulated within any desired limits by the addition or removal of weights to the regulator yoke. In practice this device regulates the pressure within a very few pounds. Stephen M. Gaston, 511 E. Magnolia street, Sherman, Texas, is the inventor.



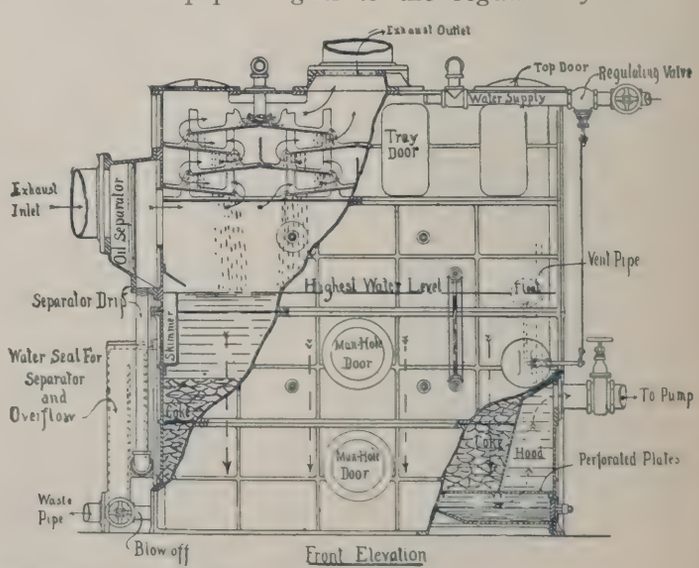
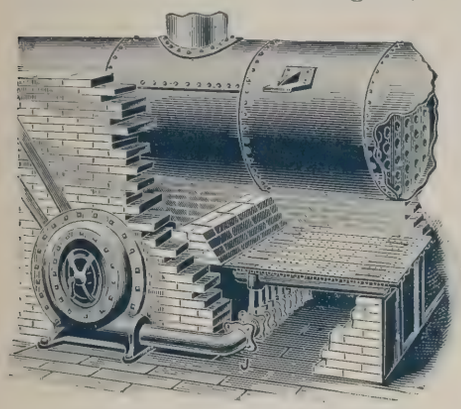


FIG. 1—COCHRANE EXHAUST HEATER AND PURIFIER.—FIG. 2.

GORDON HOLLOW BLAST GRATE.

Recent improvements in the construction of this grate, making it a draft as well as a blast grate, are



GORDON HOLLOW BLAST GRATE.

shown herewith. The larger engraving shows the general arrangement of the grate and its connection with the blower, while the smaller one is a cross section of the improved grate bar. This consists of a perforated top and a hollow body with air outlets in line with the perforations in the top of the bar. In passing from the outlet *E* to the perforation *D* the jet of compressed air carries with it a portion of the surrounding air, as indicated by the arrows, thereby furnishing a greater volume of air than would be supplied by the blast alone. It is evident also that this construction admits of the grate being used with natural draft, as the perforations in the top are independent of those in the hollow body of the bar. These bars are uniformly six inches in width, and of any desired length, so as to fit any furnace. The manufacturers (the Gordon Hollow Blast Grate Co., of Greenville, Mich.), state that in a furnace fitted with these bars, dust, culm, slack, and other refuse of coal, are as effective as coal of much better quality on an ordinary grate.

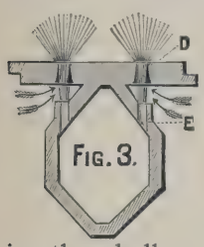
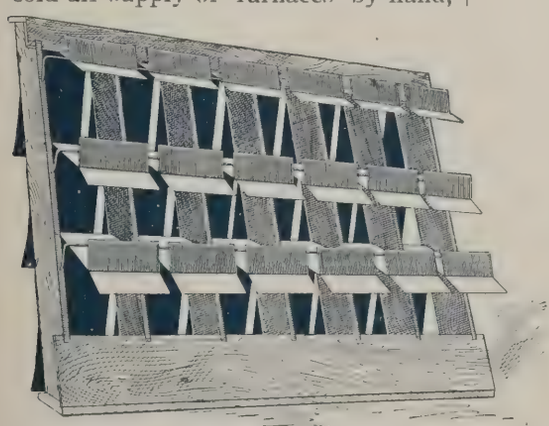


FIG. 3.

RICHARDS' COLD AIR REGULATOR.

The object of this device is to obviate the necessity of adjusting the cold air supply of furnaces by hand,

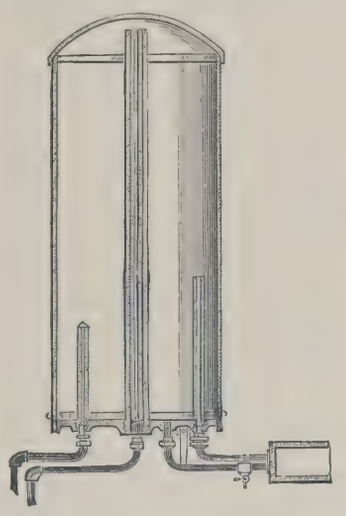


RICHARDS' COLD AIR REGULATOR.

and to overcome the effects of winds. It is automatic in action, positively governing the flow of air through the cold air duct in which it is placed. It consists of a frame, of the same size as the window admitting cold air, which is divided by vertical bars into a series of openings in which are hung a series of outer and inner balanced iron valves, the outer ones acting to more or less reduce the cold air supply according to the pressure of the wind, and the inner ones closing the opening when there is a reverse action tending to take the hot air out of the cold air box. C. W. Richards, 90 Euclid avenue, Cleveland, O., manufacturer.

DUNCAN'S CIRCULATING BOILER.

This boiler is designed to do away with unsightly pipes outside of it, the



DUNCAN'S CIRCULATING BOILER.

bottom shell of the boiler being provided with three legs so that all couplings are readily accessible. The boiler may be placed on any boiler stand or on the floor of a bath room, for which it can thus serve as a radiator. The supply is carried twelve inches up into the boiler, making it non-siphonable, and is provided with a deflector to throw the cold water downward. The upper circulating pipe is carried eighteen inches up into the boiler, the lower circulating pipe discharging direct from the bottom of the boiler into the waterback. The hot water is taken from the top of the boiler by means of the cold water. W. E. Duncan, Forty-ninth street below Woodlawn avenue, Philadelphia, manufacturer.

LYON'S FUEL SAVER AND HEAT RADIATOR.

The manufacturers of the device shown by the accompanying broken sectional cut make some very re-

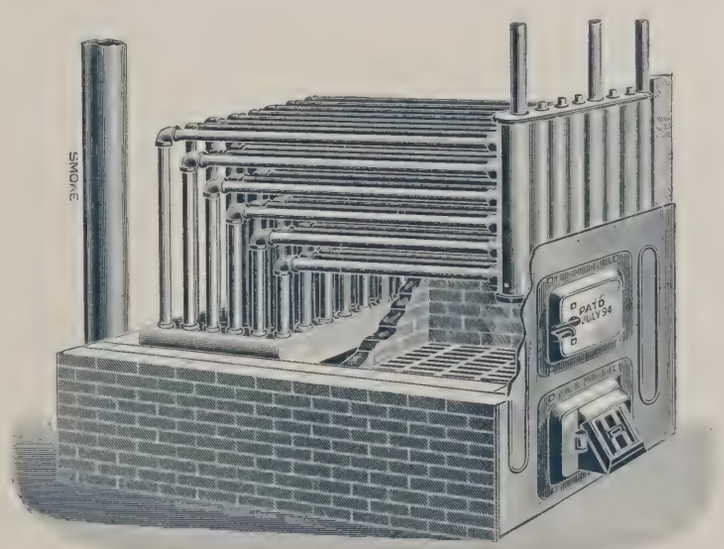


LYON'S FUEL SAVER AND HEAT RADIATOR.

markable claims for it in the way of fuel saving. As clearly shown by the cut, the device consists of an arrangement of pipes, one within the other, by which the smoke passes upward and downward until the greater part of its heat is radiated into the room. Means are provided whereby direct draft may be secured when desired. The Lyons Fuel Saver and Heat Radiator Co., Goshen, Ind., are the manufacturers.

MUNSON HOT WATER BOILER.

The accompanying illustration shows a hot water heating boiler manufactured by Daniel Munson, 417 Irving street, Syracuse, N. Y., by whom it was invented. As shown by the cut, the boiler is simple in construction, consisting of a number of wrought iron pipes connected by elbows and screwed into simple flow



MUNSON HOT WATER BOILER.

a tube within a tube, so that the water is discharged at the bottom without coming into contact with and return sections. The cut illustrates a heater having something over 140 feet of radiating surface.

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BOILERS may deteriorate from non-use more than from continuous service with proper attendance. Such an instance is related by John A. Fish in the correspondence columns of our last issue. In his case the boilers to be laid off were kept full of water to prevent internal corrosion, with the result that the large body of cold water caused condensation on the fire or air side of the tubes, and the resulting moisture mixing with the deposits upon the iron produced rapid corrosion. This action has inclined engineers to completely empty their boilers, rather than to leave them full, taking off the plates so as to secure a free circulation of air and keep the sheets clean and dry. The boiler is thus always open for inspection, and any tendency to corrosion can be quickly detected. This communication emphasizes the necessity of thoroughly cleaning a boiler before it is laid off, and points out the reason why it may be so injurious to a boiler to use it intermittently.

THE DOUBLE duct system of mechanical heating contemplates the conveyance of warm and of cool air by means of separate conduits to a given place of union, usually at the base of each individual flue, where the proper device is provided for mixing them in the required proportions. The question has often been raised as to whether it is practicable to force through the cold air pipe, air just as it is taken from out of doors, without increase of temperature.

SUCCESS with such arrangement must depend upon the means of mixing and of control adapted. At all events, the mixing damper must be made so as to be easily closed tight against cold air when so desired. Otherwise even a small leakage of cold air may seriously affect the operation of a heating system at a time when it is taxed to its uttermost. It is evident also that such a damper can only be operated satisfactorily by hand or by a proportional-acting thermostat, which may, under certain conditions, act to close it tightly against either hot or cold air as the case may be, and at other times may hold the damper in such intermediate positions as to secure the proper mixture of air of the two temperatures.

WITH a thermostat acting intermittently so as to turn on to the room either all warm or all cool air, and securing their mixture within the room itself, it becomes positively necessary that the cold air shall be tempered before it is admitted to the duct in which the damper acts. This tempering of the air is generally accomplished by separate primary coils through which all of the air passes and is raised to some given maximum temperature below that of the room to be heated. A portion of the air then is discharged directly into the cool air duct, while the remainder passes through a second heater and is raised to a temperature above that to be maintained within the room. Such an arrangement is somewhat complicated and expensive, and it is, therefore, not surprising to discover that a simpler device has been adopted in some instances.

THIS consists, in the case of a regular fan blower discharging through a heater for warm and "by passing" above it for cool air, of a hinged damper in the diaphragm, separating the heating coil from the cold air duct above. This is so designed as to swing upward and thereby permit a portion of the air to escape up between the heater pipes into the cold air duct; at the same time this damper shuts off an equal amount of the cold air which is being discharged direct from the fan, with the result that the cold air duct beyond is filled with tempered air secured by thus mixing the different volumes. Such a damper is readily operated by lever and chain, and serves as an exceedingly simple and ready means of control.

SYSTEMS of mechanical ventilation are very often faulty in that, while the supply of a sufficient volume of pure, fresh air has been provided for, the ducts through which it is conveyed are of too contracted area, so that the air enters the rooms at too high a velocity, causing disagreeable currents and too much of an admixture of the pure and impure air within them. Naturally this lessens the useful effect of the air admitted, which should act as nearly as possible to push the impure air out bodily before it, thus replacing the foul air instead of merely diluting it. The best results can be obtained in hot blast heating and ventilation only by introducing large volumes of air moving at a slow velocity.

THE use of exhaust steam is the more profitable as the percentage of the steam utilized is increased, and as the back pressure produced by its use is reduced. If we add back pressure to an engine we increase the mean pressure required upon the piston in order to maintain a given mean effective pressure; that is, we increase the horse-power of the engine, so far as the boiler is concerned, by an amount equal to the horse-power constant multiplied by the back pressure added, and require a proportionately greater supply of steam. It may be said that if it pays to run with the back pressure on one hundred square inches, it will pay to run with it on one thousand if we have use for ten times as much steam. We are led to this later explanation through an argument with an engineer who, with an extensive use for heat, would not use the exhaust steam on account of the effect of the required back pressure on the large piston of his engine.

Gas Heating.*

BY BURDETT LOOMIS.

There is a difference of opinion as to whether gas will ever entirely replace coal for heating and power purposes; also as to the quality of gas that it is best to furnish, for it will not be long before at least one-half of the output used will be for purposes where its value will be rated by heat units instead of candle power.

Heating by gas opens a wide field, and is a complex problem. What can be done under existing conditions with gas at present prices? With gas having 650 heat units per cubic foot, $1 per thousand, and anthracite coal having 14,000 heat units per pound at $6 per 2000 pounds, 28,000,000 heat units in 2,000 pounds of coal cost $6; 28,000,000 heat units in 43,076 cubic feet of gas cost $43.07; say 7 to 1 in favor of coal on the heat unit basis.

This does not appear very encouraging, but it must be borne in mind that the above represents but the heat capital, and it is to be demonstrated how much of each can be effectively utilized. It will be interesting here to compare the heating value and costs of coal gas for cooking. In a recent test of one day's cooking by coal and gas the following amounts of coal and gas were used: 30.68 pounds anthracite coal at $6, costing .0920; 67.88 cubic feet of gas at $1, costing .0678, the kindling being left out, the cost of gas being about two-thirds that of coal. Had it taken as many heat units with gas as with coal the result would have been different; 30.78 pounds of coal having 429,530 heat units, at $6 per ton, cost .0920; 661 cubic feet of gas having 429,650 heat units, at $1 per thousand, costing .661; or 7 to 1 in favor of coal, presuming the proportion of heat utilized was no greater in the gas stove than in the coal stove. These are the figures that the pioneer in gas cooking faced and gloriously conquered.

As good a showing is not to be expected in heating, as modern coal heating appliances utilize a larger per cent of the heat units than cooking stoves using coal, and the beginning should be made in places most favorable for gas. Small rooms that are heated but for a short time and irregularly, can be heated by small gas fires in grates or heaters economically, and here they fill a want that coal cannot, as they can be started and shut off without trouble and act quickly. Open gas fires are giving much satisfaction in houses and offices that are already heated by the usual methods, and the cheerful glow and strong radiant heat, quickly produced when needed, the freedom from dust, with the handsome appearance of many of the later appliances, insure a steady increase in this direction.

There is a field for heating on a larger scale, using hot air, hot water, or steam heaters, in which but little has as yet been accomplished. Stores that are open but eight or ten hours daily, and where room is valuable, the basements being used for storage, where freedom from dirt and dust of coal fires is important, here hot air or hot water furnaces using gas will prove very satisfactory.

In stores and in large blocks in cities the gas can be turned off at night and started in the morning, so that it is in actual use but half the time. Many such places are now paying for steam heat from a central plant double what it would cost them to run their own heaters with coal, as this is the only way they know of getting rid of the dirt and annoyance of running their own system. A gas furnace would meet all of their requirements, and a gas hot air furnace can be put in at one-half the cost of a steam heater, and certainly will run as cheaply. Saloons and restaurants that are open until midnight, and using large quantities of gas for lighting, the lights in most cases heating their places through the evening, should heat through the day by gas. Now the gas in lighting is but adding to the income of the steam heating company.

For heating entire dwelling houses through the year, gas at $1 is a luxury that those who enjoy must pay well for, but there are times and conditions when gas can be so used. Many city houses with but the front and back exposed are now equipped with two hot air furnaces, one large and one small. The latter is used during the fall and spring, when but little heat is needed, and that intermittently, and the small furnace is needed a few exceptionally cold days in winter. The larger furnace runs steadily through the colder part of the winter, and does the greater part of the heating. A gas hot air furnace would work to great advantage in place of the smaller furnace. The summer variations in temperature during autumn and spring can be met by a gas furnace, and as the volume of heat required is not great, the gas consumption would be light. For the same reasons portions of the United States where the climate is mild and the temperature in winter corresponds to that of New York city during autumn and spring, affords advantages for gas heating. Gas men should post themselves on store and house heating where gas offers the greatest advantage. They should study appliances so as to know which is the best for each case. A hap-hazard selection of place and appliances will insure failure. A handsome appearance is as essential for small heating appliances as economy. Where 50 cubic feet or more of gas per hour is needed, a good gas hot air furnace or hot water heater is the most economical and effective. These furnaces will utilize not less than 90 per cent of the available heat generated by the gas, and the popularity of these systems is established. With a thermal regulator the temperature can be maintained at any desired point.

The prospect for using furnaces for heating with gas has been greatly improved by the introduction of those constructed to use gas solely for fuel, together with improved burners and regulating devices. With the best of these appliances it is now possible to utilize nearly all the sensible heat, and even part of the latent heat.

*Extract from a paper presented to the American Gas Light Association.

A fire-proof and water-proof substitute for paint, for use in boiler and engine rooms, consists of six quarts of freshly slaked lime, well sifted, to which is added one quart of rock salt and a gallon of water, the mixture being then well boiled and skimmed clean. To five gallons of this mixture are added a pound of alum, half a pound of copperas (stirred in slowly), three-quarters of a pound of potash, and four quarts of fine sand or hard-wood ashes, well sifted. To this may be added any coloring material desired. It is said to be as durable as slate, and to be especially applicable to brick work and similar surfaces.

Bagging, buckling, or bulging of boiler plates, sometimes forming a pocket, generally occurs from overheating the iron in consequence of deposits of oil, sediment, or scale. Sometimes it occurs when the boilers are clean, and then it is the result of impact of flame, or it may be caused by the unequal expansion of the various laminæ of the plates under their daily usage in case there are no signs of overheating. It is very liable to occur in the flat fire-sheets on the sides of fire-box boilers when the stays are spaced too far apart. The usual remedy in this case is to put an additional stay-bolt between each four stays already there. The presence of a bulge on the bottom fire-sheet of a boiler is not necessarily dangerous, but it must be watched carefully, and its surfaces kept clean, and at the first indication of weakness it must be heated and forced back into place, or else cut out and a hard patch put on.

A mathematician of Massachusetts, who, according to a local paper, feels that the dictates of scientists are becoming rather expensive in these latter days, has been doing a little figuring on the subject, and he says that to introduce into school rooms the amount of air per minute that some plans call for, and to bring it through the prescribed conductors, would create a current against which no man could stand, and the result would be to blow teachers and pupils into the corners of the rooms and hold them there until the ventilation was shut off. Again, he finds that according to scientific requirements it would be impossible for a person to live in his dining-room long enough to finish a meal, and as neither he nor any of his family nor guests has ever been suffocated, he is naturally led to question whether this "cubic feet of air" business is not sometimes carried to an extreme, especially where the public has to foot the bill.

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS.

Suggestions for its Advancement.

[As stated last month, the benefits to be derived from membership in the new society will be greatly enhanced by the individual interest taken in its progress, and it gives us pleasure to publish some further ideas which it is thought will best secure its advancement.—EDS.]

From John Demarest, J. F. Pease Furnace Co., Boston, Mass.

In reply to your question, "How can the American Society of Heating and Ventilating Engineers best benefit its members?" I would say that in my opinion one important point it to be careful who is admitted to membership.

From J. J. Wilson, Fuller & Warren Co., Troy, N. Y.

In my opinion the American Society of Heating and Ventilating Engineers can best benefit its members by having them carry out the spirit of the various clauses, which, under section 4, article 1, of the constitution, set forth the objects of the society. Very much is covered by the above clauses, for upon them depends our standing as a scientific and useful society. The promotion of the arts and sciences pertaining to heating and ventilation means that every member can help a little to advance the above sciences if he will, not necessarily by the solving of obstruse problems in these arts, but by furnishing the society at its meetings his observations, derived from actual practical experience. This interchange of ideas and opinions among the members of the society will go far to promote and elevate the arts and sciences as applied to heating and ventilation. The encouragement of good fellowship among its members is certainly a primary object to be sought for. There is an old saw which says, "a house divided against itself cannot stand." This means that all personal or petty jealousies, engendered by business competition or otherwise, must be eliminated; that at our regular meetings all who can attend should do so that they may have the pleasure of grasping their brother member by the hand and learn that he is really a good fellow, notwithstanding the reports of his competitors to the contrary, and that when you meet him in competition for business you will render unto Cæser those things which are Cæser's and not unjustly decry that which he represents. If you treat your brother member as you would wish to be treated, then the encouragement of good fellowship among the members of this society can be accomplished.

It will be noticed in stating that one object of the society is improvement in the mechanical construction of the various apparatus used for heating and ventilation, nothing is said that such improvements are to be patented, or become the property of any particular person, but it is intended that such improvements shall be for the benefit of its members as a whole, that they may advance in the science of heating and ventilation untrammeled by the necessity of using any patented systems to obtain definite and satisfactory results.

The maintenance of a high professional standard among heating and ventilating engineers can be accomplished by having the society make the necessary provisions for an acquisition of knowledge pertaining to the different systems of heating and ventilation, first, by a well-selected library containing the standard works on the above arts and sciences, not with a view of their being used as a standard and definite data, but that a perusal of them may brighten the mind and lead it into such channels of thought as may be conducive to practical scientific results, and second, by the establishment of an experimental laboratory, well equipped, in which scientific data relating to heating and ventilation could and would be obtained for its members by some member of the society, competent to make and obtain such data, and who should receive a reasonable compensation from the society for such scientific research.

I would also advise the formation of a class or classes for such members and juniors as wish to learn or advance in the knowledge of such systems of heating and ventilation as they are not conversant with, a fee to be charged such members individually sufficient to cover the expenses of tuition. Teaching could be done by correspondence, and at each semi-annual or annual meeting, such parties as took up the course could be examined by the council and upon their recommendation secure a higher rating. I believe the above suggestions would, in a great measure, help to maintain a high professional standard among the members of this society.

The establishment of a clearly defined minimum standard of heating and ventilation for all classes of buildings is a noteworthy object and one that for many years has been the subject of much controversy among the heating fraternity. My former suggestion as to the establishment of an experimental laboratory admits the formulating of this standard. Such data emanating from such a society would have much influence with those who have heating and ventilating plants erected and would be the means of elevating the society to a high professional plane.

There are devious ways in which legislation compelling the ventilation of all public buildings in accordance with the standard of this society can be secured, and every member can do his share in securing this object. Committees can be appointed to urge and confer with those who have charge of such matters for the state and general government; members can individually promulgate their views and ideas, not only in the trade papers, but in the daily and weekly periodicals, which reach the masses, who are really the parties who should be most interested. It is said that the constant dropping of water will wear away a stone, and while the object sought for may at first seem difficult of accomplishment a constant urging and alertness to take advantage of every opportunity to push forward the benefits to be derived from the adoption of compulsory laws, will eventually result in their enactment.

The intention of the clause favoring the encouragement of legislation favorable to improvements in the art of heating and opposition to legislation inimical to the business of the heating engineer seems to indicate the desirability of the appointment of inspectors of heating and ventilating plants, similar to the system now in vogue in Massachusetts, but without some of the disadvantages resulting from a different interpretation of the law in different districts. The adoption of the clause in object fourth, with a few other changes, would do away with the above complaint.

The reading, discussion, and publication of professional papers and the interchange of knowledge and experience among its members is an object, which, if followed, will do much to attract the members to the different meetings of the society and make such meetings a pronounced success. An interchange of knowledge and experience among members cannot fail to promote good fellowship, and there need not be cause for any one to hide his light under a bushel. All can have a chance to shine and at the same time derive much beneficial information the value of which cannot be computed in dollars and cents.

The establishment of an uniform rate for professional services will tend to elevate the profession and do away with the hawking around of plans to have them arranged by the cheapest man—this, in many cases, being the cause of imperfect work.

The laborer is worthy of his hire. How many, after having planned a system of heating and ventilation, and submitting it in competition, have seen this system adopted by the parties receiving such plans and installed by competitors who had neither the time nor ability to devise such plans. I can answer very many. I know of cities where bidders in the plumbing line add an extra percentage to their estimate on the cost of work bid on, which the successful bidder pays, such percentage being divided per rata among his unsuccessful competitors to compensate them for time used in making plans, estimates, etc. I sincerely hope to see the introduction of this plan among the heating fraternity, when we are stronger and thoroughly organized.

In conclusion, I do not think the gentlemen who formulated the above eight objects realize how well they have designed. If these objects are adhered to, undoubted success will attend every effort of the American Society of Heating and Ventilating Engineers.

From George D. Hoffman, Chicago.

In my opinion the American Society of Heating and Ventilating Engineers will be a grand success and fill a long felt void in the ranks of heating and ventilating engineers if the society as a whole will adopt the two words *merit* and *ability* as necessary qualifications of all members.

There are hundreds of men, and firms for that matter, who are in the heating business, and who take contracts for fitting different buildings with heating apparatus, who are no more entitled to the name of engineer than a ten-year old boy. They do not know the reason why they do lots of work. They simply know from past experience (and that experience was acquired under the direction of some one else) that certain methods and adjustments would produce certain results. I claim that these men are not heating and ventilating engineers. They have not the ability to lay out their work, nor to give the reasons why their work is done in a certain way. These men, in my opinion, are not entitled to memebrship in the American Society of Heating and Ventilating Engineers. The certificate of membership in this society should be a voucher and a credential to the public at large that the holder thereof is a competent man in his profession, and worthy of all the confidence that may be reposed in him in his particular line of work.

If this discrimination is made a rule of the organization, and religiously enforced, there is no question in my mind but that any heating engineer who is worthy of the name will esteem it an honor to belong to the society and use his utmost efforts to gain admission to it. If, however, it is made open to any one who has the necessary initiation fee the society will soon fall to the ground.

From W. B. Wilkinson, Howard Furnace Company, New York.

In answer to your question, "How can the American Society of Heating and Ventilating Engineers best benefit its members?" I should say in brief that as the Society is composed of practical men engaged in distinct branches of heating, and as both heating and ventilation work while based upon general principles is subject to change in each contract, each engineer having a plan and method of his own, an exchange and interchange of plans, methods, and views, either by debating controverted points or by presentation of prac-

tical work successfully done, with reasons for so doing, etc., would be of great benefit and of general interest.

Again, as hot water, hot air, and steam have their advocates, or, we might say, partisans, also the several forms of ventilation, and in our society there are some who, while experts in each line, have comparatively little practical experience or knowledge of the other lines, they might be greatly benefited by short lectures or papers or symposiums at certain times upon each of the different forms, and so tend to harmony and fraternity, where there may have existed rivalry and boasted superiority of one system over another.

From James R. Willett, Willett & Pashley, Chicago.

I know of no better way in which the members of the American Society of Heating and Ventilating Engineers can best benefit its members than by thoroughly understanding the business and practicing it honestly, with a disposition to give special information that you may have derived from experience, and also to discountenance the idea that there is any peculiar patent or secret system in the possession of anybody as to the proper method of heating and ventilation as best applicable under all conditions and circumstances.

From H. E. Light, Eureka Heating & Ventilating Co., Saginaw, Mich.

While I was for fifteen years a large manufacturer of steam and water heating apparatus, preparing many plans with details for various buildings in many states, I noticed the greatest embarassment arose from a want of knowledge and skill on the part of contractors or others setting steam work. Perhaps the want of such knowledge and skill has really led to the loss of more money for a given number of years than was made during the same time. Also, the want of skill has done very much to detract from the active demand of steam heating apparatus, and to permit the setting of inferior work, such as stoves and furnaces, whereas had there been ample skill on the part of those setting, results would have popularized the setting of steam and water heating apparatus with a consequently large increased demand.

The above conditions prevail to quite an extent at this time, though not so much so as formerly, hence I would suggest that the American Society of Heating and Ventilating Engineers would best benefit its members by a thorough dissemination of the practical ideas involved in successful adjustment and setting of apparatus. This may be accomplished by the preparation of papers by skilled engineers, a liberal discussion of the points made in such papers; the more unanimous action following from the society establishing precedents with such needed information as master fitters are largely in want of.

The organization should be careful to confine its discussions and papers only to practical ideas. As Gen. Grant once remarked, "It is wonderful how positive a person will be as to a matter he knows nothing about." I have many times been reminded of this remark in connection with heating and ventilation. Too many persons of superficial knowledge assume too much responsibility; embarrassment follows many times with a repudiation of apparatus, which, had it been properly set by experienced engineers with a proper adjustment, would have given satisfaction.

Theoretical ideas are valuable, but only as good experience proves them practical, and only those commencing at the bottom round of the ladder and reaching the top by practical advances are thoroughly skilled.

From James Mackay, American Boiler Co., Chicago.

In regard to our inquiry, "How can the American Society of Heating and Ventilating Engineers best benefit its members?" I would say that in my opinion it can be of great service to its members, by following out the article agreed upon by the committee on organization. I would suggest that the object of such a society should be, as far as possible, to embrace all sections of this continent, and it should not be in any sense what might be termed a local organization. I would like to see more charter members enrolled from the West. It is well known that there is more money invested and more men employed in the West than in the East, still a very small proportion of the members of the society are from the West.

LETTERS FROM PRACTICAL MEN.

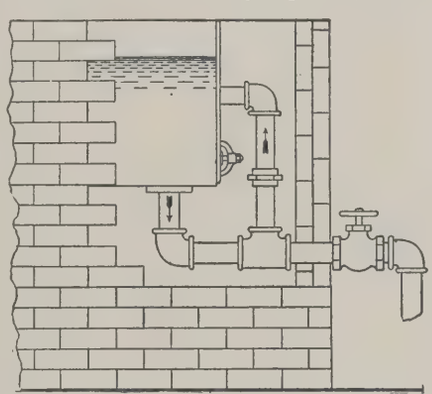
Correspondence from practical men upon topics of interest relating to Heating, Ventilating, and kindred subjects, will find a place in this department. The editors, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

The Wasteful Use of Exhaust Steam.

Mr. Wakeman, in your September issue, seems to have read my letter (August issue) very hurriedly. The work done on my two tests was practically the same, viz., 183.5 and 176.5 horse-power respectively. His statement is therefore entirely incorrect. My tests simply showed that a back pressure, so far as cost of power only is concerned, is wasteful. I said nothing whatever about exhaust heating. His views and mine are probably identical upon that subject. Jay M. Whitham.

Circulation in the Blow-off Pipe.

Serious trouble having been occasioned in a steam plant by the frequent burning out of the blow-off pipe of a horizontal, tubular boiler, I have suggested as a remedy the plan shown in the sketch. It is simply a return pipe from the blow-off, entering the boiler head a little below the water line. This, in my opinion, would



CIRCULATION IN THE BLOW-OFF PIPE.

give a constant circulation in the blow-off pipe, thereby preventing overheating and consequent burning out. Are there any objections to the plan? Walter.

The Cause of Leaky Boilers.

Some time ago a strange thing happened at Jamestown, N. Y. A steam plant was started up, everything being new. A surface condensor was used. The feed water was taken from the hot well, so of course the water of condensation from the engine went back into the two boilers. After running about four days, No. 7 boiler started to leak in the front tube sheet, the manhole plate, and the seams. The fire was hauled and the boiler examined, and found to be badly buckled. A boiler maker was called, and pronounced it a case of low water; but the engineer in charge and the man who erected the engine are ready to swear that there was plenty of water and the fires were light. Before the boiler maker went away the No. 2 boiler started to leaking in the same way. I should like to hear from your readers as to their opinion of the cause of the leaking. Was it the oil from the engine? O. S. R.

Low Radiation.

Seeing in your October issue under your editorial notice some remarks as to the increased efficiency of low radiators, and a recommendation to the effect that the most valuable location for placing direct radiation in a room is exactly under the windows on the exposed side, set me to thinking.

First, it is not always convenient to get radiation (on account of space) in low heights, with sufficient radiating surface to warm a room, by placing it under a window. Again, it is often objectionable to have a radiator in one's parlor or sitting room immediately under the window, as the occupants often desire to have easy access to their windows, and the placing of a radiator under the window discommodes them. Again, when sitting in close proximity to a window there is nothing, to my mind, more disagreeable than to have a radiator throwing off its heat in front of one's nostrils and thereby producing a suffocating feeling.

I have practiced the heating business for some years, and I have found that radiation placed on the inside wall of the room has given about as good satisfaction as when placed on the outside walls or underneath the windows, in fact. I am successfully heating houses where the radiation is placed upon the inside walls. In my own house the radiation is placed on the inside walls in several of my rooms, and heats them successfully. In warming a room by direct radiation the proper situation of the radiating surface for the attainment of an equable temperature is in some respects a mooted question.

In 1846 there was published by Dr. Morrell Wyman, of Boston, a book called "A Practical Treatise on Ventilation and Warming," containing much novelty at the time, and of lasting excellence. The work, now out of print, is as suggestive as Walker's "Hints on Ventilation," with which it may be compared. I quote as follows:

"As long ago as '46, Dr. Wyman called attention to the way in which heat was distributed in any room, when the source of heat was situated as usual at the back of the room, against an inner wall, with windows and exposed outside wall at the front or side of the room; and he showed that a layer of highly heated air collected next the ceiling, whence descended a sheet of air along the cooler wall and window surfaces, becoming itself cooled in its descent, until at about the height of a man a uniform temperature of comfortable warmth was established throughout the room. It is in conformity with this principle that, in the practice of warming in America by means of a hot air furnace, the hot air flues from the furnace are generally led up inside an inner wall, remote from windows or outside walls, and a tolerably equable and comfortable warmth is obtained by admitting into the room a limited quantity of very hot air, sometimes nearly as hot as 400 degrees at the inlet. A closed stove, situated likewise against an inner wall, proves similarly effective but with an open fire the draft of cold air, which from some source or other takes its course along the floor to the fire place, seriously impairs the desirable uniformity of temperature in a room.

"In warming by steam with direct radiating surfaces, the practice for many years was to arrange the steam pipes in lines or groups, called coils, along the bottom of the outside walls, or under the windows. But present usage seems to indicate that better results can be obtained by placing the radiating surface where it will apparently be warming what is already the hottest part of the room; in reality it then promotes the natural circulation, whereby the proper diffusion of the warmth is aided, instead of being retarded. For warming rooms in mills the most recent practice is to place the direct radiating pipes in rows overhead, suspended a foot or two from the ceiling, and two or three feet from the outside walls. Although by this arrangement the heat would apparently be expended in the top of the room, yet very satisfactory results are thereby obtained, in regard both to equability of warming and to efficiency of radiating surface."

I know this question has been much discussed, but I do not believe it has yet been solved to the satisfaction of the heating fraternity. Elbow.

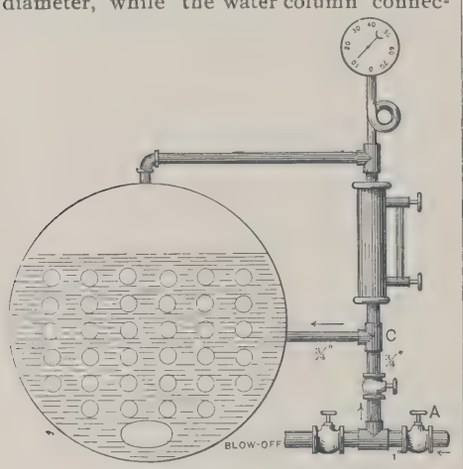
Leaky Boiler Tubes.

The trouble which Mr. Fish mentions in the September issue as having occurred in one of the plants put in by him, owing to the acid from the coal eating away the tubes while left full of water and not in use, is not an uncommon one, but a very simple and effective remedy exists for it. It consists in swabbing out the tubes with lye, the lye being fairly strong. If Mr. Fish tries this, he will find that he has no further trouble, no matter how long the boiler is left unused, and that the tubes will be absolutely free from rust and corrosion when started up again. If the tubes are to be left for more than a year, they should be first swabbed out with the lye, and then with blacklead and oil. R. H. F.

A Dangerous Pipe Connection.

The other day, having an hour to spare, I dropped into the engine room to a flour mill, which has a 40 horse-power plant with tubular boiler. Last fall the proprietor of the mill decided to have one floor of the mill heated by steam, as they had a spare margin of boiler capacity. Steam was taken from the top of the boiler to the coils, which were located far enough above the boiler to allow the water of condensation to return by gravity.

The contractors who put in the coils thought it too much trouble to tap the boiler for the return pipe, so they connected it at the water column as shown in the sketch. The return pipe is one inch in diameter, while the water column connec-



A DANGEROUS PIPE CONNECTION.

tions are of ¾-inch pipe. The result is obvious.

The water, in returning, tends to flow past the tee at C, raising the water in the column and making the water gauge entirely unreliable, the variation from the true water level in the boiler being often as much as five or six inches. The only way to ascertain the true water level is to close the valve A in the return pipe, and the water in the column would drop to the level of that in the boiler.

This job was done by a firm of contractors in a neighboring town, and it was considered by them a good job.

CHAS J. LARSON.

The Oft-asked Question.

The writer presumes that like himself all manufacturers, contractors, and salesmen who are in any way connected with steam or hot water heating are very frequently asked by prospective buyers the question, How much coal will this heater burn? Having been so often asked how I answered the question when it was put to me, and as I have never been able to get from any one any kind of a reply to the question, I give the following as the answer which I give to the inquiry. Be it private individual or committee, I look at him or them, and smiling, say, "Sir, or gentlemen, if you will answer me the following questions, I may be able to give you an answer to your question."

"What kind of a winter is the coming one going to be, a very severe one, a very mild one, or one in which the thermometer will not fall very low, but in which there will be strong, keen, cutting winds, under which condition it requires a large consumption of fuel? Who is going to attend to the firing of the heater, you yourself, who will study economy, or a person who does not care a rap about the consumption of fuel so long as he obtains the heat required? What kind of fuel are you going to use, coal of good clean quality, a poor grade with a lot of dirt in it, or a suitable size coal that is neither too large nor too small for the size of grate, fire pot, and heater? What kind of a chimney have you, one with a good draft, so that you can run your fires with the dampers shut and check draft open, and thus burn a steady fire, or one with such a poor draft that yon generally have to leave your dampers open so as to obtain anything like a fire, and thus cause a good part of your heat to pass up the chimney? When you say you require your buildings heated to 70 degrees do you really mean seventy-five or eighty degrees? Having answered these questions I can no doubt tell you about how much coal you will burn.

J. L. S.

NEWS AND NOTES.

New York City

Messrs. Samuel and Henry Corn, 945 Madison avenue, will erect an eight-story brick sales building at 91 and 93 Fifth avenue, at a cost of $165,000; Louis Korn, architect. Frederick M. Sauer, Conrad Gross, and George Hebauer will erect twelve five-story brown stone dwellings on 91st street, east of Amsterdam avenue, at a cost of $264,000. David Richey, 146 West 82d street, will erect two five-story brick apartment houses on the south side of 97th street, west of Central Park West, at a cost of $50,000; G. A. Schellenger, architect. William and James Bingham, 16 East 116th street, will erect three five-story brown stone dwellings on the south side of 118th street, west of Fifth avenue, at a cost of $60,000; J. Valentine, architect. Lizzie A. McCone, 1393 Vyse avenue, will erect four two-story frame dwellings on the east side of Vyse avenue, north of Fremont street, at a cost of $16,000; Alexander C. McCone, architect. John D. Buck, Inwood, New York, will erect a two-story frame dwelling on the south side of Koppack street, north of Jackson avenue. John D. Ireland, 15 East 47th street, will erect a seven-story brick factory on the northeast corner of South Fifth avenue and West Third street, at a cost of $85,000. James E. Farley, Boulevard and 171st street, will erect a seven-story brick flat and store on the southeast corner of Columbus avenue and 77th street, at a cost of $65,000; Messrs. Thorn & Wilson, architects. Peter A. Jackson, 53 East 67th street, will erect a seven-story brick warehouse at 15 East 23d street, at a cost of $50,000; John H. Kruekl, architect. Mary A. Kirkham, 772 East 174th street, will erect three two-story dwellings on Bathgate avenue, north of 180th street, at a cost of $10,500; J. J. Vreeland, architect. Albert C. Morris, 1666 Amsterdam avenue, will erect three five-story brick dwellings on 145th street, near Amsterdam avenue, at a cost of $105,000; Wesley J. Knaress, architect. J. W. Livingston, 102 East 86th street, will erect two five-story brick dwellings on 88th street, near Madison avenue, at a cost of $60,000; Lorenze F. J. Weihr, Jr., architect. Feurniss V. Gaines, 133 West 91st street, will erect three five-story brick dwellings on St. Nicholas avenue, north of 119th street, at a cost of $55,000; George F. Pelham, architect. Mary A. Kirtcham, 772 East 174th street, will erect three two-story dwellings on 174th street, near Vanderbilt avenue, at a cost of $10,500. W. P. Ostrander, 269 West 13th street, will erect two five-story brick flats on Eighth avenue, near 111th street, at a cost of $40,000; Messrs. Neville & Bagge, architects. Charles Lane, 238 East 42nd street, will erect a five-story brick flat at 110 East 83rd street, at a cost of $15,000. Frederick Jenth, architect. N. F. Proctor is erecting a new theatre on the east side, having entrances on Third and Lexingon avenues and 57th and 58th streets, at a cost of about $100,000. The Union Methodist Episcopal Church on 48th street, which is now in the course of erection, will cost about $30,000. Frederick McCarthy, 1019 East 162nd street, will erect four two-story family dwellings on the west side of Prospect avenue, north of Dawson street, at a cost of $40,000; W. C. Dickerson, architect. John Cotter, 418 Mott avenue, will erect a five-story flat and store on the corner of Mott avenue and 144th street, at a cost of $35,000; John C. Burne, architect. Messrs. Kirchener and Kurrenknabe, 30 West 133d street, will erect four five-story dwellings on the south side of 62d street, east of Eleventh avenue, at a cost of $100,000. Edward Wenz, architect. Plans have been filed in the Building Department by Dewitt C. Blau, 80 Maiden Lane, for a six-story brick dwelling at 6 East 61st street, at a cost of $75,000; H. H. Robertson, architect. Jonas Weil and Bernard Nayer, of 227 East 60th street, will build a five-story brick dwelling at 153 and 151 Allen street; Messrs. Schneider & Herter, architects; cost $30,000. A five-story brick and stone dwelling will be built by Alexander A. Jordan on the southwest corner of Madison avenue and 89th street; Messrs. Neville & Bagge, architects. Cost $125,000. John Pettit, 9 Beekman street, has filed plans for a seven-story brick office building on the northwest corner of Thames and Greenwich streets, to cost $100,000; J. M. Farnsworth, architect. A five-story brick flat will be built by John Halligan, 1768 Madison avenue, on the southwest corner of Amsterdam avenue and 157th street, at a cost of $28,000; Richard R. Davis, architect. The Metropolitan Life Insurance Co., 1 Madison avenue, has filed plans for an eleven-story brick office building on the south side of 24th street 149 feet east of Madison avenue; N. Le Brun & Sons, architects. Hugh Getty, 224 Ninth avenue, will build a seven-story brick factory, to cost $29,000, on Thirtieth street, south side, west of Third avenue. At 38 Mott avenue, James M. La Costa will build four five-story brick buildings; H. S. Baker, architect. Adam E. Fishel, 9 Stanhope street, Brooklyn, has filed plans for two five-story brick apartment houses in West 85th street, east of Columbus avenue, to cost $130,000; architect, John G. Prague. Charles Van Riper will build five three-story brick dwellings on the southwest corner of Prospect avenue and 152d street, at a cost of $20,000; architect, James M. Laboset. Charles S. Baudouine, 718 Fifth avenue, has filed plans for a nine-story iron and limestone front store building at the southeast corner of Broadway and Grand street, to cost $128,000; Alfred Zucker, architect. Anna T. Dale, 851 Walton avenue, has filed plans for the building of four five story brick flat houses on the north side of 134th street. The buildings will cost $72,000; Wm. L. Dale, architect. Edward Judson, 22 West 99th street, has filed plans for the building of a seven-story brick flat house on the northwest corner of Bedford and Downing streets, to cost $95,000. Two six-story brick flats, to cost $100,000, will be erected on 90th street, east of Madison avenue, by Fred H. Hawkins 125 East 15th street. John H. Slusk, 320 West 102d street, has filed plans for the erection of two five-story brick flats on the east side of Fifth avenue, north of 111th street; Edward Wenz, architect; cost, $50,000. William Zellner, 1385 Fulton avenue, will build a two-story frame dwelling at 1379 and 1381 Fulton avenue, at a cost of $22,000; William Grant, architect. Adam N. Geib, 444 West 50th street, will build two five-story flats on the south side of 80th street, west of Amsterdam avenue, at a cost of $46,000; George F. Pelham, architect. The Ninth Regiment will build a $300,000 armory on 14th street, after the plans of Cable & Sargent, architects. Phillip Braender, 15 East 93d street, will erect six five-story brick apartment houses on 114th street, west of Seventh avenue, at a cost of $120,000. William Grant, architect Five three-story brick dwellings will be erected on 149th street by John J. Mahoney, 51 West 44th street, at a cost of $80,000. Henry and Hartman Schmidt, 534 East 89th street, will erect two five-story brown stone front dwellings on the south sideo of 94th street, west of Park Avenue, at a cost of $56,000. Edward Wenz, architect. M. J. Donohue will erect a four-story brick tenement on 567 Eagle avenue, at a cost of $11,500. John Jacob Astor will erect a handsome twenty-story building on the corner of Fifth avenue and 34th street, near the Hotel Waldorf, at a cost of about $700,000. James P. Bowers, 443 East 51st street, will erect a five-story tenement at 212 West 17th street at a cost of 20,000. Richard Damm, 3619 Third avenue will erect a four-story brick tenement on Third avenue, near 169th street, at a cost of $16,000. Maria A. Wuytack will erect five three-story tenements on Webster avenue, north of 169th street, at a cost of $25,000. Simon Schaefer, 640 Eagle avenue, will erect two five-story brick flats on 127th street, near Third avenue, at a cost of $25,000. Marty Del Danno, 1337 Simpson street, will erect two three-story frame tenements on Tiffany street, south of Intervale avenue, at a cost of $12,000. Herman Schmuck, 782 Union avenue, will erect two five-story brick flats on 136th street, near Willis avenue, at a cost of $44,000; and five two-story brick flats on 136th street, west of Willis avenue, at a cost of $22,000. Margaret Stonebridge will erect eight two-story dwellings on Columbine avenue, north of Jefferson street, at a cost of $24,000. Maggie L. Smith will erect a five-story flat on the corner of Tenth avenue and 67th street, at a cost of $14,000; George Keester, architect. John McLaughlin, 346 East 81st street, will erect four five-story dwellings on 87th street, west of Madison avenue, at a cost of $75,000; A. B. Ogden & Sons, architects. J. L. Butenwieser, 227 East 60th street, will erect a five-story and basement flat at 9 Thompson street, at a cost of $24,000. Abbey Runk, Webster avenue and Tower Place, will erect a three-story brick dwelling on Webster avenue, near Moshula Parkway, at a cost of $12,000. The Twelfth Regiment will erect a new Armory on 14th street, west of Sixth avenue, at a cost of $297,800. Randolph Guggenheimer, 46 Wall street, is erecting four large twelve-story buildings on the site occupied by the New York Hotel, at Broadway, Mercer street, and Wavelry and Washington Places. The buildings will cost $164,000; Mr. R. Maynice, architect. Messrs. Canary & Lederer will erect one of the finest places of amusement in the world on 42d street, near Seventh avenue, at a cost of $500,000. Edward V. Doew, 25 East 57th street, will erect a one-story frame structure on the corner of Amsterdam avenue and 122d street, at a cost of $25,000; Max Bauman, architect. The executors of the estate of George Bruce Brown will erect two six-story factories on the corner of Fulton and Gold streets, at a cost of $25,000; John Downey, architect. The Sherman Avenue Baptist Church will erect a new edifice on the corner of Clinton avenue and Monmouth street, at a cost of $35,000; Sarah Rafel, 106 West 87th street, will erect four three-story dwellings at 1050 Boston avenue, at a cost of $12,000; Messrs. Marsky, Isaacks & Narder, architects. Anna H. Leary 1064 Home street, will erect four three-story dwellings on Intervale avenue, on the north side of Home street, at a cost of $24,000. John De Hart, architect. Adam Fischer, 9 Stanhope street, will erect two five-story brick houses on Columbus avenue, near 85th street, at a cost of $13,000; and three five-story dwellings on West 85th street, east of Columbus avenue, at a cost of $48,000; John G. Prague, architect. Vincenzo Luechise, 114 East 119th street, will erect four five-story dwellings on 62d street, west of Amsterdam avenue, at a cost of $64,000; J. Averit, Webster, architect. William Griggotz, 2305 Bathgate avenue, will erect four two-story dwellings on 183d street, west of Washington avenue, at a cost of $15,200; William Griggotz, architect. Daniel Hennessey; 799 Madison avenue,

will erect two five-story dwellings on 82d street, west of Madison avenue, at a cost of $80,000. Henry Anderson, architect. William H. Hall, 227 Lenox avenue, is erecting four five-story brick flats on the corner of Amsterdam avenue and 82d street, at a cost of $80,000; John Hauser, architect. The trustees of the corporation of St. Phillip's Church, 280 Broadway, will erect a four-story dwelling at 129 West 30th street, at a cost of $25,000. Messrs. Fowler & Hough, architects. The executors of Samuel Vernon will erect a six-story brick building at 65 and 67 Duane street, and 22, 24 and 26 Elm street, at a cost of $140,000; Bassett Jones, architect. Messrs. Kastens & Cassel, 679 Tenth avenue, will erect a five-story brick flat on 68th street, east of West End avenue, at a cost of $100,000; George F. Pelham, architect. Sellick Bros. will erect a four-story brick store building on Amsterdam avenue, corner of 62d street, to cost $22,000; Richard Berger, architect. Mrs. Ellen Kearns, 667 East 142d street, will erect two five-story brown stone dwellings on the south side of Willis avenue, east of 142d street, to cost $32,000; J. H. Valentine, architect. James A. Cunningham, 591 East 142d street, will erect two five-story flats at 63 and 65 East 117th street, at a cost of $36,000; Nicholas Conforte, architect. Mary Ann Whiston, 324 East 83d street, will erect a five-story brick dwelling at 348 East 114th street, at a cost of $14,000; Andrew Spence, architect. John A. Stark, 320 West 102d street, will erect two five-story brick flats on Fifth avenue, north of 111th street, at a cost of $50,000; Edward Wenz, architect. Joseph P. O'Donnell, 1677 Vanderbilt avenue, will erect three two-story dwellings on Tiffany street, north of 174th street, at a cost of $16,500; Michael J. Garvin, architect. H. Lewis Cohn will erect three five-story brick flats on 103d street, near Fifth avenue, at a cost of $60,000; Frederick Friend, architect. John Kehoe, 335 East 15th street, has filed plans for a seven-story brick store building at 73 and 75 West Houston street, to cost $65,000. F. P. Donkelberg, architect. Oscar Hammerstein, 120th street near Fifth avenue, will erect a four-story brick dwelling on the south side of 120th street, west of Fifth avenue, at a cost of $20,000; G. A. Schellinger, architect. Messrs. Fischel Bros., 166 Henry street, will erect three five-story brick flats at 633, 635 and 637 East Fifth street, at a cost of $66,000; Max Muller, architect. Herman Schmuck, 77 Prospect avenue, will erect four two-story brick dwellings on the west side of Union avenue, south of Dawson street, at a cost of $24,000; Edward Wenz, architect. F. Bornkamp, 117 West 87th street, will erect two five-story brick flats on 99th street, east of Third avenue, at a cost of $35,000; James Barrett, architect. W. D. A. Bauhahn, 2157 Second avenue, will erect a five-story brick flat at 416 East 117th street, at a cost of $18,000; Messrs. Schneider & Herter, architects. Jonas Wiel and Bernard Mayer, 227 East 60th street, will erect a five-story brick flat on 109th street, east of Second avenue, at a cost of $18,000. Jennie Graham, 1236 Madison avenue, will erect three four-story brick dwellings at 128 and 130 East 71st street, at a cost of $48,000. Thomas Graham, architect.

Philadelphia.

A new steam heating plant is to be introduced into the Bartram house at 33d street and Woodland avenue, at a cost of $10,000. A. Segal, 305 Drexel building, is the contractor. McCoach & Johnston, 1607 Sansom street, are about erecting four three-story stone dwellings at 49th street and Windsor avenue. Another heating plant is also to be installed in the parish building of the Church of the Incarnation, at Broad and Jefferson streets, by Contractor Frank R. Watson. James G. Campbell will erect a three-story brick mill at Frankford avenue and the Pennsylvania Railroad.

Oakford, Gibson & Co., builders, 3312 Mantua avenue, are erecting thirty-eight two-story dwellings on the east and west sides of Bonsall street, at a cost of about $57,000. They are also the owners. D. B. Feldman will build a handsome three-story dwelling on Gowan avenue, east of the Philadelphia and Reading Railroad, in the 22nd ward; William J. Gruhler, 46 Hermann street, Germantown, builder.

Ground has recently been broken for the erection of five two-story dwellings at Somerset street near 11th street for John Kleber. J. W. Hallahan will have a steam heating plant installed in the apartment house now being erected on the southeast corner 12th and Walnut streets. Vallee Bros. & Co., who are erecting a five-story building at 617-619 Arch street, will also have a steam heat plant. The Merion Title and Trust Company will erect a handsome three-story building at Anderson and Lancaster avenues, Ardmore. A new school building is being erected at Richmond and Ontario streets. Three handsome houses will be erected on the south side of Wishart street, between Emerald and Jasper streets.

S. Fridenberg will erect a large storage house at 18th street and Fisher's Lane. The Friends' Asylum at Frankford will soon have an extensive heating plant. James L. Stevenson will erect 22 handsome dwellings at 32nd and Berks street very soon. Five large houses are now in the course of erection for Michael Whelan at 12th street and Snyder avenue. Five more houses will be erected at the corner of Second and Tasker streets by Robert M. Mitchell. Charles A. Heintze will erect five two-story dwellings on the west side of Emerald street north of Stella avenue and will also erect six on Stella avenue west of Emerald street.

A mammoth warehouse will be erected at Broad and Cherry streets; Hugh Craig, Jr., owner. Lum Smith is making extensive interior alterations to the Agents' Herald Building, on Frankford avenue. A new store and office building is to be erected on the corner of Main and Harvey streets, Germantown, by Harry Witherstine, 5120 Newhall street. A two-story brick store and office will be erected at 1205 Race street by Thomas M. Seeds, Jr., builder. Twelve very handsome three-story stone dwellings are to be erected on Spring Garden street between 36th and 37th streets for Benjamin Gardiner. Jacob A. Spitzer proposes to erect a number of houses on the corner of Ontario and Broad streets.

Thomas P. Lonsdale has prepared plans for a new Roman Catholic Church of Our Lady of Lourdes to be erected at Overbrook, to cost about $45,000. Plans have also been drawn by the same architect for a parochial residence at the same place. John Wannamaker will erect three large store buildings on the corner of 12th and Chestnut streets. The Universalist Church of the Messiah, corner of Broad street and Montgomery avenue will have a splendid addition erected in a few months.

Division No. 50, Ancient Order of Hibernians, will erect a new three-story lodge on Woodbine avenue, north of Boyer street, Germantown, to cost about $15,000. Plans are being prepared to erect eight houses for Horace Manley, at Media, by architects Titus & Roberts, 132 South Fourth street. The same architects have prepared plans for alterations on the residence of A. G. Elliott on Johnson street west of Main street, Germantown. A handsome row of houses will be built at Merchantville, New Jersey. Titus & Roberts are the architects. Architect E. C. Kent, 140 South Fourth street, will erect a three-story dwelling for John J. Houghton at Ambler. A three-story mill building and one-story office will be erected at Frankford avenue and Pennsylvania Railroad for John G. Comfell & Company. Clayton R. Slawter is the contractor.

Plans are in preparation for a five-story brick building to be built on Ontario and Cumberland streets for the Golden Eagle Brewery; Jacob Herald, 441 Chestnut street, architect. O'Brien Bros. will erect seven large houses on the west side of Woodbine avenue, north of Boyer street. Fourteen two-story houses are to be built on the south side of Arlington street, west of 32nd, by James L. Stevenson. The same operator is to put up eight three-story dwellings at Ridge avenue and Diamond street.

Five two-story brick dwellings are to be erected by Chas. E. Frick, at the northwest corner of Norris and Belgrade streets. The plans and specifications for the twenty-two houses being erected by William Weightman on Twenty-third street, above Ridge avenue, were made by Willis G. Hale, 1524 Chestnut street. McIlvain & Strong, 110 North Thirteenth street, are to build eight two-story stone and brick dwellings on the south side of Clairon street, east of Kettlewell, Twenty-fifth Ward.

Timothy Gallagher is to build twenty two-story dwellings and one store and dwelling on Guenther street, south of Oxford. Five two-story houses are to be built on William street, east of Amber, by James B. Cary; also five on Cambria street, east of Ambria.

Contractors have been invited to estimate on plans for the Administration building and the new County Prison at Holmesburg; Wilson Bros. & Co., architects. Ground has been broken at Front and Kaighn avenue, Camden, for the construction of a $20,000 hotel. The building is being built by G. F. Rothcracker. Christian Brown has made plans for ten three-story brick dwellings, at Leidy and Girard avenues and Forty-second street.

Contractor M. McMannus has taken out a permit for a three-story schoolhouse, to be built at Jasper and Sargent streets. Eight three-story dwellngs are to be erected by Weekey, Dade & Noble of Philellena and Green streets, Germantown, on the south side of Harvey street, between Green street and Wayne avenue, at a cost of about $80,000; William Albert Wood, architect. The contract for the new students' hall at the University of Pennsylvania has been awarded to Williams McPherson, they being the lowest bidders, for $130,000.

Joshua M. Holmes, 1233 Girard avenue, will build fourteen two-story dwellings on the west side of 22¾ street, north of York; also three of two stories, and a three-story brick store and dwelling at the northwest corner of 32¾ and York streets. Ten three-story stone and brick dwellings will be erected on the east side of 15th street, north of Venango, by W. A. Margerum, 924 Mt. Vernon street. Plans for a very large addition to be built to the plant of the People's Traction Co., at Mt. Airy have been submitted by Contractor Chas. McCaul. He will also enlarge the plant of the Electric Traction Co., at Lehigh and Ridge avenues.

Plans have been prepared for a six-story building for Hood & Co., Clearfield streets. The congregation of St. Luke's M. E. Church have selected Thos. P. Linsdale to prepare plans for a new structure at Broad and Jackson streets. The building will be heated by steam. Work is about to be commenced on an operation on the east and west sides of Ruth street, south of Monmouth, consisting of nine two-story brick dwellings; also on the southeast side of Monmouth street, west of Jasper, ten two-story brick dwellings. Entire cost $29,000. Sixteen two-story brick dwellings are to be erected on the south side of Brewster street, east of Twentieth, by R. D. Evans, at a cost of $24,000.

On the southeast and west corners of Moore and Mole streets, J. H. Beverlin, 1604 S. Broad street, has commenced work on six three-story brick houses to cost $12,000. Field & Metzger, 905 N. 42nd street, will erect six handsome three-story residences on the south side of Girard avenue, west of 41st street, at a cost of $30,000. Plans for the erection of two large brick structures to be added to the gas engine manufactory of Schleicher, Schumm & Co., have been approved by the Building Inspectors. Permit has been granted Geo. F. Payne & Co., 401 S. Juniper street, for the erection of a four-story warehouse at 116 Delaware avenue. Seventeen houses will be built by Wright & Dager at Jackson and Hermitage streets.

Preparations are being made to erect a large publication house, in addition to and opposite the present quarters of the Baptist Publication Society, on the north side of Samson street, east of Fifteenth. Ground will be broken for ten large houses on Carlisle street north of Westmoreland; A. M. Zane, builder. The contract for the erection of a four-story warehouse, for the Pennsylvania Company for Insurance on Lives and Granting Annuities, at 116 So. Delaware avenue, has been awarded to George. F. Payne & Co. Thirteen small houses will be built by Robt. Manley at 50½ and Thompson streets; and on Thirty-seventh street, north of Thompson street, he will build thirteen more.

Drawings are being prepared by Architect Joseph M. Huston for the six-story apartment house to be built by William Boyd at Eleventh and Christian streets. A public three-story hall will be built by M. J. Welsh on the west side of Richmond street, south of Allegheny avenue. L. A. Hubbs will erect four large houses on the south side of Cumberland street, east of Twenty-seventh. A permit has been granted Contractor Bird, to build for Julius Sichel Co., a four-story store at 50 North 8th street, at a cost of $12,000.

Contractor J. Humphreys proposes to build 114 houses on Eighteenth, Nineteenth, Gayuga and Wingohocking streets. School buildings will be built at Twenty-seventh and Wharton streets; Twelfth and Allegheny avenue, Nineteenth Ward; Howard and School streets, and 63¾ street and Westmoreland avenue. The plans for a new building, prepared by Architect Joseph Huston, have been approved by Rev. Russell H. Conwell president of the Samaritan Hospital. Messrs. Geo. W. Kelley and T. P. Smart are to build on the east and west side of Rosewood, north and south of Ritner street, sixty-one two-story brick dwellings, also on the north and south side of Ritner, east of Rosewood street, nine three-story brick and wood stores and dwellings. Cost $71,100.

Brooklyn and Long Island.

Wilfred Burr will erect five more two-stcory brown stone dwellings on the north side of Jefferson avenue, west of Lewis avenue. They are to contain all improvements and hot air heating. Cost $4,000 each. Plans have been prepared for four four-story brick flats to be erected on the south side of Myrtle avenue, east of Lewis avenue, for Kaufman & Co.; F. Holmberg, architect. Seven four-story brick and stone flats will be erected by David W. Brown on the southwest corner of Marcy avenue and Hope street. They are to cost $6,000 each.

Plans and specifications for a commodious brick and stone edifice to be erected on lots adjoining the present Bushwick Avenue Congregational Church have been adopted. R. G. Williams, of New York, will erect two four-story brick and stone flats on the southeast corner of 59th street, Fifth avenue and 49th street. They will cost $6,000 each. Wm. Danmer has furnished plans for Chas. Dorscher of Van Siclen avenue for five five-story brick double apartment houses. They will be built on Broadway near Hewes street, and cost about $45,000.

A public hall will be erected by Bloodgood H. Cutter, of Little Neck. It will be two stories in height. A dwelling will be erected by O. M. Burton on Main street, Farmingdale. Architect Deremer, of Springfield, is drawing plans for the proposed new school building at Valley Stream Junction. D. P. L. Hull will erect a handsome cottage opposite St. Paul's Church, Jamaica.

Eight four-story brick flats will be erected on Ralph avenue, east side, south of Hancock street. F. L. Hine has completed plans for C. Hine, 301 Gates avenue, for three four-story brick double flats, to be erected on Prospect place, near Washington avenue. They will cost about $18,000. Plans have been furnished by Wm. B. Tubby to the Morris Building Company, 26 Broadway, New York, for the erection of a brick Belleville stone front building on Ryerson street, opposite the Pratt Institute, which will use it as a library. It will cost $95,000.

J. A. Phillips has completed plans for Charles Hart, 531 Third street, for the erection of two brick double flats at 130 and 132 St. Marks avenue. They will cost $16,000. Plans prepared by Louis Donander for the erection of four three-story frame apartment houses to be built on Stockholm street near Irving avenue, Twenty-eighth ward, have been furnished to V. Bonagur, of 106 Schenectady avenue. On Fourteenth street near Eighth avenue, Chas. C. Firth will erect five two-story and basement brick houses, to cost about $18,000.

Edward Neuschler has prepared plans for M. O. Baker, 635 Prospect place, for the erection of ten brick flats buildings on Ralph avenue, between Hancock and Jefferson avenue, to cost $77,000. James Bowe has purchased a plot on the corner of Oceanus avenue and the surf, Rockaway Beach, and will erect a three-story frame hotel containing all improvements, to cost $20,000. The congregation of Babylon (L. I.) M. E. Church have had plans prepared for a new brick and stone church, to be erected on the corner of Deer avenue and James street. Cost $20,000.

The designs of Architect C. K. Birdsall, of Bay Shore, for a new schoolhouse at Bayport, L.I., has been accepted. The building will be erected on the west side of Snedecor avenue and will cost $6,000. Valentine Bangert has the contract to erect the two new primary schools at Jamaica. The contract price is $14,595. Ground has been broken for the new school of the Friends' College at Locust Valley. It will stand in the rear of the present building, be constructed of brick, and two stories and attic in height.

Chicago and the West.

Chicago.—A six-story office building located on River and Dock streets, costing not less than $90,000, will be erected by John B. Legnard. August Fiedler, architect for the Board of Education, has prepared plans for the building on Blue Island avenue and 16th street; it will cost about $70,000. Architects Holabird & Roche have planned elaborate plans for a fine residence to be erected at the northwest corner of Drexel boulevard and 46th street for Mr. A. O. Slaughter, the banker; the cost of this edifice will approximate $80,000. Plans have been prepared by T. C. Goudie for a store and flat building at the southwest corner of Central Park avenue and 22d street, for F. W. Shaeffer; it will be steam heated and cost $25,000. J. W. Kenevel is completing plans for a handsome apartment building at the southwest corner of 49th and Atlantic streets, for Perham & Durbin; it will be heated by steam and cost about $100,000.

Lee Brothers will erect three three story flat buildings on 71st street, at a cost of $15,000; Francis J.

Norton, architect. C. F. Gardiner will erect a three-story and basement apartment house on Madison avenue, near 73d street, at a cost of $15,000; W. L. Newman, architect. S. W. Cannel is erecting a three-story and basement apartment house on the northeast corner of Cornelia and Rokeby streets, at a cost of $32 000; it will be heated by steam; Brompton & Lawson are the architects.

Plans are being prepared by Thomas McCall for a large store and flat dwelling at 494 47th street, for J. Mormack; it will have all the latest improvements, and will cost $20,000. J. B. Fox will soon erect a three-story apartment house on Dearborn street, south of Burton Place, steam heat, to cost about $14,000; Messrs. Brompton & Lawson, the architects, have also designed a 3-story and basement apartment house to be built on Buckingham place, west of Evanston avenue, to cost $18,000. Mrs. M. A. Eisfeller will erect a handsome 2-story dwelling on Jackson boulevard west of 43d street; E. M. Newman, architect. Schroeder & Koster have designed for E. Hauser a handsome 3-story building to be erected at 47th street and Union avenue, at a cost of $15,000. Peter Houser is erecting a handsome 3-story building on the corner of 47th street and Union avenue, at a cost of $12,000. Nicholas Hunt will soon erect two 3-story apartment houses on Monroe avenue, near 58th street, at a cost of $22,000. F. G. Karasek will erect a handsome 3-story flat building at 1166 West 12th street, at a cost of $12,000; Otto A. Kupfer, architect. Thomas P. Hicks is erecting two handsome residences on Sacramento avenue and Walnut street, at a cost of $15,000; Osborn J. Pierce, architect. A. A. Sprague will soon commence to erect a handsome 3-story residence at 2636 Prairie avenue; Shepley, Rutan & Coolidge, architects.

C. M. Palmer has made plans for six residences on Ellis avenue, near 64th street, for C. C. Landt; they will be 2-story buildings and cost $25,000. Julius Speyer reports that plans have been prepared for a 3-story building to be erected on Lake avenue, at a cost of $75,000; it will contain eight stores and sixteen flats. The construction of the Carolina apartment house, at the northwest corner of Rush and Indiana streets, will soon be commenced; it will be an 8-story building, and cost $180,000. I. C. Zarbell is taking figures on a store and manufacturing building on Jackson street, extending back to Quincy street; it will cost $45,000. Robert Rae, Jr., is letting contracts for an apartment building at 4735 to 4749 Calumet avenue, for Marcus M. Brown; it will have steam heat, and cost about $100,000. The Committee on Grounds and Buildings were authorized to advertise for bids on an 18-room school building for the String street site in the district bounded by Sixteenth, Nineteenth, Throop and Paulina streets; for another site in the district bounded by Chicago avenue, Ohio, West 46th and West 52d streets. C. Harris will erect a 5-story and basement flat building on Robey street, near Jackson Boulevard, at a cost of $16,000; William H. Lamson, architect. William T. Lesher is accepting figures for a handsome store and flat building to be erected at State and 24th streets, at a cost of $35,000 to $40,000; it will be a 4-story structure, and will contain steam heat and have all the modern improvements.

Plans have been prepared by H. S. Jaffray for a residence at 6463 Sheridan avenue, for Robert Johns, to cost $12,000. Messrs. Norton & Goodrich are erecting three handsome residences, 3-stories. with all the modern improvements, on Boulevard place, near Grand Boulevard, at a cost of $17,000; Messrs. Schlacks & Ottenheimer, architects. Ostling Brothers have prepared plans for a store and flat building at 428 Wells street, for P. J. Pinger; it will cost $18,000. Julius de Horvath has prepared plans for a $40,000 warehouse at the southwest corner of Peoria and Congress streets, for Keper & Son.

J. F. & J. P. Doerr have just let contracts for the St. Clara parochial school, which is to be erected at the southeast corner of 64th street and Woodlawn avenue, for St. Clara Catholic congregation; it will cost about $20.000. Murphy & Camp have designed for John Keehan a three-story flat building to be erected at 4329 Indiana avenue; it will be heated by steam, and cost $15,000. A. L. Klein is erecting a 3-story flat dwelling on the corner of West Division street and Washtenaw avenue, at a cost of $20,000; Edward C. LaBelle, architect. H. M. Hansen has designed for F. D. Turner a double 4-story apartment house to be built on Wrightwood avenue, near Clark street; it will be heated by steam and lighted by electricity; cost $25,000.

M. J. Burke will erect a 2-story and basement apartment dwelling at 4213 and 4215 Wabash avenue, heated by steam, at a cost of $15,000; Charles Eppinghausen, architect. A. Lipsky will erect a 4-story and basement dwelling on Prairie avenue, north of 31st street; it will be heated by steam and cost $12,000; Charles Eppinghausen, architect. The Pilgrim Temple Baptist Church, Rev. J. P. Thoms, pastor, will erect a new church at 824 North Leavitt street; it will be heated by steam, and cost about $15,000; the congregation will erect on the lot adjoining, on the corner of Leavitt street and West North avenue, a very handsome flat building, also heated by steam, at a cost of $20,000. The Chicago City Council will erect a new smallpox hospital on 34th street, between Hamlin and Lawndale avenues; it will be the most modern of its kind in Chicago, and will cost about $200,000.

The new home of the YoungWomen's Christian Association, which is now in the course of erection and situated on Michigan avenue, north of Eldridge Court will soon be completed at a cost of about $130,000; John M. Van Osdel, architect. M. M. Brown is erecting nineteen 3-story dwellings on the corner of Calumet av nue and 47th street, at a cost of $190,000; steam for heating will be supplied from three central plants, and hot water will be supplied in the same way; Warren H. Milner, architect. J. R. Smith will erect a handsome 3-story and basement residence on 55th street boulevard, near Washington avenue, at a cost of $10,000; Messrs. Church & Jobson, architects. Frank E. Burley will erect five 3-story dwellings on the corner of Forest avenue, near 35th street, at a cost of $35,000; Messrs. Church & Jobson, architects.

R. J. Walsh will erect a 4-story apartment building at 194 and 196 Cass street, steam heat and all modern improvements, at a cost of $20,000. Julius Tesmer will erect two 3-story flat buildings on Rosebud street, near Bloomingdale road, at a cost of $13,000; Messrs. Quenzel & Hibbard, architects. The West Chicago Street Railroad Co. will erect a story and basement power house at 47 Western avenue, at a cost of $120,000; they have also begun to erect a 1-story and basement car-house at 1991 and 2003 West Madison street, at a cost of $75,000. Parker Grace will erect a handsome 4-story apartment house at 50 Oak street, at a cost of $20,000; E. M. Newman, architect. L. Klein will erect an addition to his retail dry goods store 4-stories and basement high, steam heat and all the most modern improvements, on the corner of Halstead and Liberty streets, at a cost of $30,000; Messrs. Furst & Rudolph, architects. Henry Zoelk is erecting a handsome store and 4-story flat building on the corner of Lincoln street and Chicago avenue, at a cost of $22,000; William Ohlhaber, architect. E. L. Yarlott will erect a stone dwelling at 5443 and 5445 Drexel avenue, at a cost of $25 000; steam heat; J. A. Miller, architect. John G. Krusa will erect a 4-story building at 158 and 160 Newberry avenue, at a cost of $29,000; J. Molitor, architect. The Board of Education will erect a 3-story school house on Champlain avenue, between 65th and 66th streets, at a cost of $70,000. S. J. Arado will erect a 5-story hotel at 387 South Clark street, at a cost of $15,000; J. E. O. Pridmore, architect. R. C. Berlin will erect a handsome 2-story dwelling in Sheridan Park, at 3171 Malden street; it will be heated by hot water and will cost $12,000; R. C. Berlin, architect.

The State will erect a Home for Juvenile Female Offenders at Geneva, and steam heat, electric light, sanitary plumbing and the like will be used; cost $63,330; Messrs. Curry & Foster, architects. The Evangelical Lutheran St. Paul's Church will erect a handsome edifice on Madison avenue, between 66th and 67th streets, at a cost of $10,000; Messrs. Bright & Burfeind, architects. The Chicago General Railway Co. will erect three buildings on 31st street, near Kedzie avenue. The city will erect a 1-story basement brick electric light station at 299 and 301 South Halstead street, at a cost of $40,000. D. W. Potter will erect a handsome 3-story residence on the east side of Drexel boulevard, between 46th and 47th streets, at a cost of about $15,000; Frederick W. Perkins, architect. F. S. Sherman will erect a handsome 4-story dwelling on North street, near Burton place, at a cost of about $15,000; Frederick W. Perkins, architect.

San Francisco, Cal.—The Nob Hill Development Company are erecting a big apartment house on the northwest corner of Jones and California streets, at a cost of $500,000. Messrs. Bugbee & Gash, architects. Numerous alterations will be made on the Garibaldi Hall on Broadway street between Montgomery and Kearny, at a cost of about $15.000. Three flat buildings will be erected on the Bolton property on Jones street near Greenwich, at a cost of $15,000. A bachelor apartment house will be erected on the southwest corner of Geary street and Van Ness avenue very soon; M. J. Lyon, architect. A new hotel will be erected on the southeast corner of California and Larkin streets; M. J. Lyon, architect. A two-story and basement school is to be erected on the corner of 19th and Collingswood streets. T. J. Welsh has prepared the plans.

Indianapolis, Ind.—Henry W. Piel will erect a handsome three-story stone structure on the south side of Ohio street, and on the east corner of the alley between Meridian and Illinois streets, at a cost of $15,680. Messrs. Renwick, Aspinwall & Co., of New York, have submitted plans for the erection of a new Roman Catholic Cathedral, to be built on North Meridian street, adjoining the present Chapel of Saints Peter and Paul, at a cost of $100,000.

St. Paul, Minn.—Permit has been granted the Waterous Engine Company to erect a two-story shop on the west side levee on Water street, between Eaton and Robert streets, at a cost of $25,000. Haglin & Co. have secured the contract to complete the interior of the Court House, at a cost of $36,540. The Duluth Cold Storage Company will erect a brick building on the lower side of Michigan street and at West Fourth avenue, at a cost of $40,000.

Minneapolis, Minn.—Work will soon be commenced on the property owned by W. H. Lauderdale on commission row to erect a three-story brick and stone building, at a cost of $30,000. Butler Bros. have received the contract to erect a four-story brick and stone building on First street, near Hughitt Slip, for The Twohy Mercantile Company, at a cost of $25,000. A handsome structure will be erected on the corner of First avenue, south of Fifth street, and to be known as the Hale Building, at a cost of $50,000; Charles S. Sedgwick, architect.

Kansas City, Mo.—Dr. Simon B. Bell, of Rosedale, has donated a gift of land on the southwest Boulevard to the Kansas University to erect a medical college and hospital at a cost of $50,000. A new convention hall will be erected in Kansas City very soon, and will cost about $100,000; F. M. Howe, architect.

Toledo, Ohio.—A new county jail is to be erected on the property opposite the present old court house, and will have a heating plant. Architect Stine has recently prepared plans for a handsome three-story building to be ereted on Superior street, for Halstead Brothers and A. R. Bennett, at a cost of $15,000. The Columbian Club propose to build a new club house something after the style of the Toledo club. Plans have been approved for the erection of the new Standard Oil Company's building, to be located on High street near the Lake Shore tracks.

Columbus, Ohio.—The contract for erecting the Great Southern Fireproof Hotel was signed recently by W. J. McLain, the builder. It will cost $345,000.

Grand Rapids, Mich.—Postmaster T. F. Carroll will erect a handsome residence on Lake street. Plans have been prepared by George L. Stone, architect. Architect S. J. Osgood's plan has been accepted by Peoria, Ill. for the erection of the new city hall which is to cost about $300,000.

Springfield, Ohio.—A new high school building will soon be erected in this city at a cost of $10,000.

Council Bluffs, Iowa.—A large brick building will be erected adjoining J. D. Paddock & Co.'s opera house. Part of it will be offices and club rooms.

Lancaster, Ohio.—Plans are being prepared to erect a handsome office building for the Columbus, Hocking Valley and Athens Railroad Company.

Des Moines, Iowa.—Dr. M. P. Turner will erect a fine business block on the southwest corner of Grand avenue and 7th street. It will be five stories and cost about $25,000.

Logansport, Ind.—Messrs. Stephen Taber and George Strecker will erect two handsome business blocks on Broadway above 5th street on their property.

Omaha, Neb.—The Morse-Coe Shoe Company will erect an immense five-story building very soon at a cost of about $200,000.

Detroit, Mich.—George H. Hees, Son & Co., will erect a new three-story brick factory on Fort street, west, between 13th and 14th streets. Messrs. Malcolm & Higginbotham were lately cordered to go ahead with the plans for a smallpox hospital as rapidly as possible, which will soon be in the course of erection. A new county jail will be erected on the present site of the old one.

Cleveland, Ohio.—The most expensive building permit ever issued in this city was granted for the erection of the New England block, which is to be built on Euclid avenue, at a cost of $500,000. A new city hall will be in course of erection at a very near date. Cleveland Twist Drill Company will erect a large brick factory at Lake and Kirtland streets, at a cost of $10,000. A new brick church will be erected by the Bethany congregation at Gordon avenue, at a cost of $10,000.

Findlay, Ohio.—A new three-story building is to be erected between West Crawford street and Court House place, at a cost of $25,000.

St. Louis, Mo.—Permit was granted John J. Miltenberger to erect seven brick dwellings on Maryland avenue, between Sarah and Whittied streets, at a cost of $42,000. The Young Men's Christian Association will erect a store and office building on the north side of Franklin avenue, between Grand and Ware streets, at a cost of $90,000. Messrs. Chas. A. Farris and John F. Caston, who recently purchased the property on Pine street, between Seventh and Eighth streets, will erect a modern business structure thereon. Plans have been made for the erection of the new Auber place Congregational church at a cost of $30,000. Plans have been completed by Sam. H. Hoffman to erect a row of eight-room houses on Maryland and Newstead avenues, at a cost of $50,000. John Straszer, of Manchester, will erect a large entertainment hall, which will contain all the improvements and have a large electric plant for the lighting and heating of the building, at a cost of $15,000. C. C. McFarland will erect two brick buildings on the south side of Westminster, between Kings Highway and Lake streets, at a cost of $18,000. Francis Matushek will erect four stores and eight flats on the west side of Jefferson, between Russell and Ann streets, at a cost of $15,000. H. W. Boone will erect four brick dwellings on the north side of Vernon, between Goodfellow and Clara streets, at a cost of $20,000. A new theatre will soon be erected on Washington, Pine, 11th and 20th streets, at a cost of $100,000.

St. Paul, Minn.—A new state house will be erected in St. Paul at a cost of $1,500,000. Henry Ives Cobb, of Chicago, is the expert to pass upon the merits of the plans submitted.

Evanston, Ill.—John S. Grepe is erecting a two-story and basement residence in South Evanston, with hot water heating and other improvements, at a cost of $20,000. Brompton & Lawson, of Chicago, are preparing plans for a residence on Sheridan road, between Lincoln place and Hamilton streets, Evanston, for James E. Keith. Cost $12,000.

Edgewater, Ill.—Geo. W. Maher, of Chicago, has prepared plans for two residences for John L. Cochran. They will be two stories and attic high and cost about $15,000.

TRADE NOTES.

The Powers Regulator Co. have opened a New England office at 45 Oliver street, Boston, and will carry a full stock of goods at that place. Mr. Percy MacCallum will be in charge.

F. Coggeshall, Providence, R. I., is using Exeter sectional boilers and radiators in the First M. E. Church, Pawtucket, Mrs. Hartshorn's large residence, Newport, R. I., and several other buildings.

The Pawtucket (R. I.) Steam & Gas Pipe Co. are putting in several car loads of Exeter radiators distributed among the new State Armory at Pawtucket, new town hall at Cumberland, and a number of other buildings.

W. E. Russell, Eastern agent for the Niagara Radiator Co., reports that the company is now in shape to turn out 1,400 feet of radiation a day, and that they are building a new addition for storage capacity. The radiators have been well received, and the company propose to push them hard next year.

Opinions Can Be Made is the title of a very neat little booklet issued by the Gurney Heater Mfg. Co., of Boston. If every one who receives this sample of exquisite taste will act upon the principle that opinions, not being born with a man, may be made, will undoubtedly profit largely thereby. It is well worth sending for, and by mentioning H. & V. you will get it free.

The American Pin Co. of Waterbury, Conn., one of the oldest and most reliable brass companies in the country, have succeeded Messrs. Hodge Bros. in the manufacture of the "Eureka" air valves, and are prepared to fill all orders most promptly. Mr. J. H. Hodge will hustle on the road for the valves. The name of The American Pin Co. may be somewhat deceptive to the trade; they are really large manufacturers of plumbers' supplies, castings, etc., and will be glad to name figures on any article in brass which the trade might wish manufactured.

The Kernan Furnace Co., Utica, N. Y., have recently issued a neat 144-page catalogue which fully describes their apparatus besides giving valuable data. On another page of this issue will be found an article which is taken from it,and will give a good idea of its character. It will be sent free upon application.

The Powers Regulator Co., 36 Dearborn street, Chicago, have placed their system in a high school at Hinsdale, Ill., during the past season. It has now been in operation for a month, and is working well. Another of their plants will be in operation at the Ray School, Hyde Park, Chicago, within a few days, which will be of the most modern and approved types.

Albert A. Cryer & Co., 85 Centre street, New York, have favored us with a copy of the New York CityTrades Directory for 1894-95, with their compliments. It is a well printed book of nearly 600 pages, and besides being a first-class directory, it gives important laws relating to the construction of buildings. It should be in the hands of every heating man and architect in the city.

The Dunkirk & Fredonia R. R. Co., Fredonia, N. Y., is puting in what is known as the Hawley system of steam heating with the expectation that if it proves a success it will be extended next year. Correspondence with other towns, notably Springfield, Ill., and Cedar Rapids, Ia., as well as Lockport, N. Y., showed the system to be advantageous for utilizing exhaust steam from engines used for running street railroad power motors and electric lights.

The Cleveland Foundry Co., of Cleveland, met with a serious loss by fire during October. Their four-story building, which contained their machinery, mounting floors and stock rooms, was entirely destroyed. Their foundry, japanning rooms, and tinning rooms were not badly injured, and they saved the greater part of their patterns. They were well covered with insurance, and are now occupying temporary quarters. They will be ready to fill orders in two weeks.

W. A. M. Grier, president of the Corry Radiator Co., informs us that his company is crowded with orders. Among the many orders is the new Hotel Jefferson, Richmond, Va., which was opened Nov. 1, and is one of the finest in the country. This hotel takes about 14,000 feet of radiation. The new Odd Fellows' Temple, Philadelphia, takes 15,000 feet, and the City Hall, Patterson, N. J., also uses the Corry radiation. The company will probably largely increase their output next year.

The United States Radiator Co., Dunkirk, N. Y., have been kept exceedingly busy this season, owing to the very large demand they have had for the "Splendid" radiator. As they had a large stock of radiators at the beginning of the season, and have largely increased their facilities, they have been able to fill all orders within forty-eight hours after their receipt. They wish to notify all steam-heating engineers that they can continue to furnish all orders promptly, and solicit correspondence.

The Minneapolis Radiator & Iron Co., 50 Third street, South Minneapolis, Minn., send us their new catalogue, just out, for 1895. The company manufacture a general line of heaters, radiators, and steam appliances. The catalogue is most beautifully printed and its half-tone cuts are a delight to the eye. They show the "External" radiator, steam and water, for which they claim 25 per cent efficiency over the ordinary loop type, the "External," the "Fleur-de-Lis," and also these same types with vertical flues, and the direct-indirect setting for "Efficient" or "Fleur-de-Lis" vertical flue, designed especially for ventilation in connection with public buildings. They have also a very pretty line of window and wall radiators. This company manufactures the Page steam and hot water heaters, and the catalogue is well illustrated with the several different styles. The references they show are many and very strong. Besides this, a line of fittings, feed water heaters, grease extractors, pressure regulators, steam traps, damper regulators, and die stocks are manufactured by them. Send for a new catalogue, mentioning HEATING AND VENTILATION.

Our esteemed contemporary, Architecture and Building, publishes the following: "An association likely to perform a useful function in one of the many departments which are represented in the modern building, is the American Society of Heating and Ventilating Engineers. The increased complexity of modern structures, and the demand that they shall be comfortably heated throughout as well as perfectly ventilated, has revolutionized the systems of heating. While it is but a few years since the wood stove, or when coal came into use the coal stove did service for this purpose, both in dwellings, public, buildings and audience halls, yet the improvements made since then have been such as to demand a large degree of talent, not alone in perfecting heating plants, but applying them under the various conditions presented in our modern structures. And this organization of heating and ventilating engineers cannot fail to give uniformity to practice and permit of exchange of ideas among its members which will tend to advance the character of work and prove highly beneficial to those engaged in building operations and requiring the best and most economical systems for supplying both warmth and pure air. We notice among its membership many well-known names, who by their skill and experience have added materially to the perfection of our prominent buildings in this respect. That able journal in this specialty, HEATING AND VENTILATION, gives in its last issue considerable space to the opinions of members of this organization as to the advancement of their work, and makes evident the large interest that they take in this movement. Among the various subjects coming before the architect few require more careful study than this, and the combination of this special class into an organization will be regarded by them as important. We shall expect from these gentlemen at their meetings many papers and discussions that will prove of value to the whole building trade."

The new frost proof valves manufactured by Casler & Hastings, of Buffalo, N. Y., have been accepted by that city. Get a circular.

For 1895 the Danglar Stove & Mfg. Co., of Cleveland, O., will offer a Process stove of more than ordinary merit, and one which we hope to show our readers in the near future.

The School Board at Perrysburg, O., after a most thorough investigation, have selected the Peck-Williamson Heating & Ventilating Co.'s system for heating and ventilating the new High School.

The Ranton Boiler Co., Syracuse, N. Y., effected a reorganization of their company on Oct. 1st, and are now in shape to handle boiler work for both power and heating. They are also doing some large stand-pipe work.

Mr. W. R. Mosher, the Philosopher of Troy, representing the Mosher hot air furnaces, called on us a few days since. Mr. Mosher is happy in the fact that the Liliputian and Mastadonic furnaces are all the rage. He says they are now manufacturing them in five sizes: Nos. 26, 32, 44, 74 and 144. Mr. Mosher fairly makes you freeze by hoisting a cold wave signal flag on his circular, which warns one of the coming cold weather, but also is good enough to show you how to avoid it by taking the Mosher and steering clear of all others. If interested send for circular addressing M. J. & M. R. Mosher, Troy, N. Y.

The Hohmann & Maurer Mfg. Co., Plymouth and Jay streets, Brooklyn, send us their illustrated catalogue, part II, of thermometers and gauges for steam and hot water heating, and shower or needle spray baths. They call attention to the fact that they were pioneers in this line of manufacture, and that they have embodied in their instruments all the best improvements that have been found desirable. This part of their catalogue is also well illustrated, and pages 11 and 12 are devoted to the proper setting of thermometers, which is very instructive, and fitters should send for the catalogue, which will be mailed free. Please mention H. & V.

Mr. Ira A. Holly, who, for the past five years, has been superintendent of the Syracuse Steam Heat & Power Co., has resigned his position and is now in charge of a similar plant at Scranton, Pa. Mr. Thos. Dougherty is now filling the position with the Syracuse Steam Heat & Power Co. made vacant by the resignation of Mr. Holly. The Syracuse Steam Heat & Power Co. are adding 360 feet of new steam mains, which will give them over five miles of pipe laid, including service pipe. They furnish steam to the mains at a pressure of 70 pounds, from a battery of nine 100-horse power, three 200-horse power, and one 500-horse power boilers. Inside the buildings heated the pressure is reduced to 20 pounds. They use the Holly system and furnish steam entirely by meters.

The D. F. Morgan Boiler Co., of Akron, O., send us a little leaflet enttled "Steam Heat." The pamphlet describes the Morgan surface-feed steam boilers. The company state their experiments justify them in claiming a saving in the consumption of fuel of from ten to thirty per cent over the ordinary type of heating boiler, and claim, first, that all fire surfaces can be readily cleaned after the boiler is set as completely as can be done with the ordinary form of boiler *knocked down;* second, that the ordinary servant, by simply swinging back the outside casing and opening the doors to the interior, can do the work as efficiently as the most experienced mechanic, this feature alone saving from 5 to 20 dollars per year, and as the "heat absorbing" or fire surfaces can also readily be kept clean they are as effective after years of use as when entirely new; third, that the construction also permits of an adjustment of baffle plates, so that each boiler may be adjusted to the particular flue to which it is attached; fourth, that the arrangement of interior fire surfaces is such that a part of the radiant heat of the fire penetrates, unobstructed, to the dome, "the natural reservoir," The heavy products of combustion pass into the revertible flue, and during their travel downward over the baffle plates, are cooled by coming in contact with the colder water at the bottom of boiler to a temperature between the heat of the main steam pipe and the lesser heat of the main return pipe, before escaping through the hood to the chimney flue, in this way effecting a saving; fifth, the boiler is adapted to soft or bituminous coal, as well as hard or anthracite coal.

At the Montreal meeting of the American Society of Mechanical Engineers, an interesting paper was read on methods for preserving metal used in pipes, roofs, bridges, poles, construction work, etc. In conclusion, the whole question of how best to protect iron and steel from corrosion in all the varying conditions that the wants and usages of to-day demand, seems to resolve itself into several "Donts," as the best method of answering it, to wit:

Don't have any scale on the metal.

Don't paint it with anything but pure linseed oil and oxide of lead or graphite paints.

Don't forget that frequent inspection and care are very necessary.

Don't let the cost and interest accounts be the governing factors in the case of protecting any metal structure on whose continuity and strength human life and safety depend.

In comparing the two paints recommended, it may be well to add that a properly made graphite paint should prove more durable and a better protector than oxide of lead. Graphite has a strong affinity for metal surfaces, and experienced painters claim that even where light colors are desirable, graphite paint should be used as a priming coat. Again, graphite is impervious to the action of heat, cold, sea air, acid or alkali fumes, which are more or less destructive agents to lead paints.

The Joseph Dixon Crucible Co., Jersey City, N. J., have manufactured a pure linseed oil and graphite paint for over 25 years, and have some very convincing testimonials of its value.

Mr. George E. Downe, of the Ideal Boiler Co., of Chicago, was in St. Louis for a day recently and took out of the city with him orders for two car loads of the Ideal water heaters.

The University of Cincinnati, at Cincinnati, now under construction, will be heated and ventilated by the Link hot blast apparatus, manufactured by the E. M. Link Machinery Co., Erie, Pa.

M. Mahony, of Troy, N. Y., sends us his calendar for November. Over the top appears, "No Home Complete Without the Mahony." We also feel that no home is complete without his calendar, and accept it with pleasure.

Mr. G. C. Blackmore, the well-known heating engineer, has sold his interest in the Pittsburg (Pa.) Heating Suppy Co. and has resigned the presidency and management of the business. For the balance of the year he will take charge of the United States Radiator Co., Saltsburg, Pa., and push "Ornate" radiators.

The United States Heater Co., of Detroit, were obliged to refuse orders for Mascot heaters a few weeks ago, on account of the unexpectedly large sale of these boilers, and the excessive demand upon their factory. We are advised that they have now made arrangements for outside foundry accommodations, which enable them to fill Mascot orders again without interfering with prompt delivery of Capitol and Hecla heaters.

The Kennedy Valve Mfg. Co., of 52 Cliff street, New York, have moved to new and spacious quarters at 75 John street. The new location will enable them to keep a most complete stock of all sizes of their gate, globe, angle, radiator, swinging check, and indicator valves, indicator posts, hydrants, etc. They are now in a position to ship all orders, even in the larger sizes of gate valves, immediately. Write for their illustrated catalogue and discounts.

The S. Wilks Co. report sales of the Wilkes hot water heaters to Swift & Co. for heating offices and salesrooms in their markets at Indianapolis, Ind., Springfield, Ill., and Sheboygan, Wis.; two large size Wilks heaters for the use of the "Indiana Soldiers and Sailors' Monument" at Indianapolis, Ind.; and Wilks heaters to be put up for house heating by David Lamley at New Orleans, La.; and to C. B. Shourds for his residence on 45th street, Chicago, besides a very large trade for greenhouses in all sections of the country,

P. J. Sweeney, at Albany, N. Y., writes us that business in that city is very brisk, and that he has secured and completed the following contracts to heat by hot water: Residence of Mr. J. Hubbs, E. Duncan, James Mix, J. J. Craven, P. Hess, C. Lonergau, James Kelly, Albert Rathbone, and officers of Albany Railway Co., using Gurney heaters. Steam heating contracts: Residence of E. Belmont, P. Flanigan, Belvidere Hotel, C. B. Lansing estate flats; White, Wells & Wilkins wholesale notions; De Graff, office building; Rt. Rev. T. M. A. Burkes, residence; Appleton Building; Glens Falls (N. Y.) Armory; St. Francis De Sales Orphan Asylum, and residence of Mr. J. Howard King, Ridgefield, Conn., using all new style Standard radiators on both steam and hot water work.

Mr. Alfred A. Hunting, consulting engineer, formerly at 618 Hancock Building, Boston, begs to announce to his clients and to his friends generally, that he has formed a connection with the Paul Steam System Co., 10-12 Federal street, Boston, and will hereafter be employed upon its engineering staff. A careful study of the question for many months, including an examination of many of the plants now using the Paul system for circulating steam, has convinced him that the system covers many inventions of the highest order of merit. The Paul system is remarkably efficient in the saving of waste by utilizing by-products, and the company will furnish designs and will contract for the introduction of steam heating, steam drying, and steam power devices of all kinds, or will apply the Paul system to existing or new plants. Mr. Hunting's friends will receive a cordial welcome at the company's office, where their interests will be as carefully considered as in the past.

A pleasant party of about fifty assembled at the residence of John A. Scollay, Brooklyn, N. Y., on Oct. 31 (Hallow'en), the occasion being the 67th birthday of Mr. Scollay. Mr. L. H. Hart, on behalf of Mr. Scolley's employes, presented him with an elegant easy chair. Mr. Hart said: "Friend Scolley, it is a pleasure to all of us, this evening, to meet you and congratulate you upon your good health on this, your 67th birthday. It is many years now since you came from the mother country with an ambition and a will to make your way in the world. How well you have succeeded the great name you have made for the goods you manufacture, and the many new improvements in heating apparatus and supplies you have given to the world, speak more eloquently than I can do. It should be, and no doubt is, sir, gratifying to you to look back over the many years you have been in business in Brooklyn and in America, to recall that in all that period you have been free from dissentions and strikes so common to some employers. Gathered with you to-night are a loyal band of men, some of whom have been with you for a quarter of a century; all of them appreciate your sterling worth and fairness. It has been their wish for some time to testify in some substantial way to the love they bear for you, and, sir, it is highly gratifying to me this evening to present to you, on behalf of your employees, this easy chair, and we all trust it will serve as a congenial resting place for you in your leisure moments, and if at times it recalls old memories and pleasant recollections, their object will have been attained." Mr. Scollay responded in feeling words his appreciation of the good will of his workmen, after which music, dancing, and recitations beguiled the hours away. At about 11 p. m. the whole party sat down to an elaborate lunch, under the supervision of that most estimable hostess, Mrs. Scolley, after which the guests gradually departed, all wishing the host many happy returns of the day.

The Ideal Hot Water Heaters are shown at the Exposition in Milwaukee in connection with the exhibit of the A. J. Lindemann & Hoverson Co., of that city, whose exhibit as a whole is second to none.

The E. P. Carpenter Co., of Pawtucket, R. I., who alone gave one order for 350 Magee Grand ranges, writes the Magee Furnace Co., under date of Oct. 17, as follows: "Sold ten Grands at retail yesterday." That's doing pretty well, as it shows the popularity of these goods. Mr. J. M. Sweeney, of the New York office of the Magee Co., is also keeping up the reputation of the "Magee," and has increased the trade of the company largely in the vicinity of New York since he took charge of the office.

The following circular dated New York, Nov. 1, has been received: "The undersigned, as co-partners under the firm name of Evans, Almiral & Co., will hereafter carry on the business heretofore carried on under the name of The Q. N. Evans Construction Co., and liquidate its affairs, and hope that we may continue the pleasant business relations already had with you; and they request that in the future all bills and checks for merchandise, bought or sold, be made in our name. Mr. William Andrews will continue with us in the same capacity of consulting engineer as before. Signed, Q. N. Evans, J. A. Almiral, W. C. Adams.

We are in receipt of a circular letter from the Ideal Boiler Co., of Chicago, which reads as follows: "The demand for the Ideal hot water heaters has far exceeded our most sanguine expectations. It has been a matter of regret with us that we could not have foreseen that our manufacturing facilities would not be adequate to keep up with the demand, and that our customers have been annoyed by our delay in making shipments. We beg to assure you that we have overcome this absolutely, and that our present facilities for turning out these boilers are considerably more than double what they were a short time ago. Realizing that our plant at Detroit was working to its fullest capacity, we have entered into a contract with the Novelty Iron Co. to manufacture certain sizes of these boilers at their splendidly equipped plant at Canton, O. The Novelty Iron Co. have had a successful experience in the manufacture of this class of work, having been identified for many years with the manufacture of the castings of the Spence hot water heaters for the National Hot Water Heater Co., and we can insure our customers boilers second to none as regards material and workmanship. As an instance of quick work, would say that the patterns for these boilers, which were in the sand at the Detroit plant on Friday, were transported, together with core boxes, flasks, and all appurtenances, so that a complete set of patterns were in the sand at the Canton foundry on the following Monday. All orders received from now on will have immediate attention."

The contract for heating and ventilating new school house at Hopkinton, Mass., has been awarded to Nutter & Seabury, of Boston.

The Ideal quick opening radiator valve for hot water, made by the Ideal Boiler Co., of Chicago, is one of the latest productions in this line. The valve opens with half a turn, and cannot stick. A shoulder in the barrel renders it impossible for the pipe to enter the valve so far as to interfere with the disk, which is made of a half cylinder of rolled brass, the spring of which the company claims renders leakage impossible, and at the same time provides for the expansion and contraction arising from different temperatures of the metal.

At the new town house to be erected at Cumberland, N. H., two eight-foot Allen boilers, made by the Wm. Allen Co., of Worcester, Mass., will be used. The Providence Steam & Gas Pipe Co. are doing the work.

The Economy Foundry & Machine Co., of Syracuse, N. Y., will manufacture the New Home furnaces, under patents granted Gen. George D. Sanford, of Albany, for the New Home Furnace Co., of Norwalk, Conn. Mr. Geo. H. Raymond, of Norwalk, Conn., will be general manager, and the offices of the company will be in the same town.

(*Continued on page xvi.*)

WANTED.

Announcements in this department will be inserted at the uniform rate of twenty-five cents per line. For five or more insertions of the same advertisement we make a discount of 10 per cent. Calculate on nine words to a line.

WANTED.—Several first-class tinners, who are competent to do general furnace work. First-class sober men can have steady employment. Call or address The Peck-Williamson Co., Cincinnati, Ohio.

WANTED, SITUATION.—Have been 20 years selling and setting heating and ventilating apparatus. Have fitted up many modern school buildings. Would like to arrange with some house East or West, preferably with reference to school work. C. G. SHORT. 217 27th St., Milwaukee, Wis.

TO steam and water boiler, furnace and radiator manufacturers. IRWIN WALLAS, Consulting Engineer, care Maple & Co., Tottenham, Court Road, London, W., is open to receive catalogues and best trade terms for reliable and improved apparatus, suitable for good class English residences, schools, etc. Open to give serious consideration to anything worth pushing.

WANTED.—A man with experience in low and high pressure steam heating. One that is capable of making estimates and plans, examine existing plants and report on same, as to present condition; whether they are being operated economically or otherwise. Give reference and experience, what part of the United States they have largest acquaintance. State salary expected for the first year. Address ENGINEER, care HEATING AND VENTILATING, World Building, New York, N. Y.

AGENTS WANTED

in every city.

50 PER CENT. COMMISSION

for securing new subscribers to ***Heating and Ventilation.*** Exclusive territory given.

The H. & V. Publishing Co.,
146 WORLD BUILDING,
NEW YORK CITY.

MANVILLE COVERING CO.,

MANUFACTURERS OF

Asbestos Cement, Sheep Wool Cement

AND

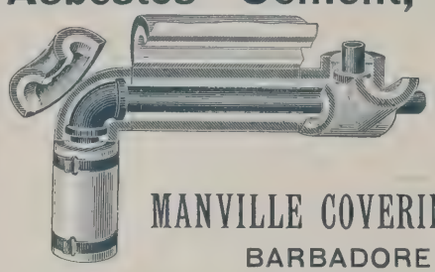
Sectional Coverings

FOR

HIGH AND LOW PRESSURE

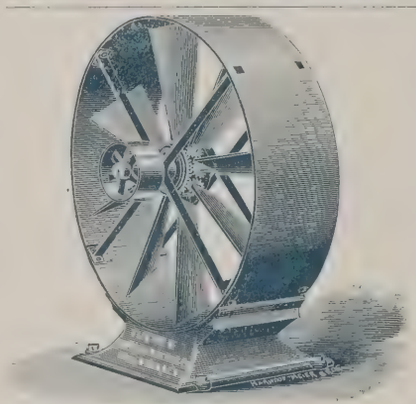
AND

HOT WATER SERVICE.



MANVILLE COVERING CO., 76 3d St., Milwaukee, Wis.

BARBADORE ST., NORRISTOWN, PA.



TUERK'S

CHANGEABLE BLADE VENTILATING FAN

The best constructed fan on the market, also the only one that the blades can be changed to deliver different quantities of air without changing speed. : :

Send for full description of Fan and prices before purchasing

MANUFACTURED BY

TUERK WATER METER CO., Fulton, N.Y.

THE CELEBRATED

SANITAS TRAPS

ENDORSED BY SANITARY EXPERTS AND LEADING PLUMBERS.

SANITAS Traps are used unvented in many of the principal cities of the United States, making a great saving to the Plumber and to the user. The Sanitas is the only Trap that will stand both syphonage and evaporation and hold its seal under the most adverse circumstances. Plumbers interested in giving their patrons the best will invariably give preference to the Sanitas Traps Made in Lead, White Metal or Iron. Send for Special Circulars.

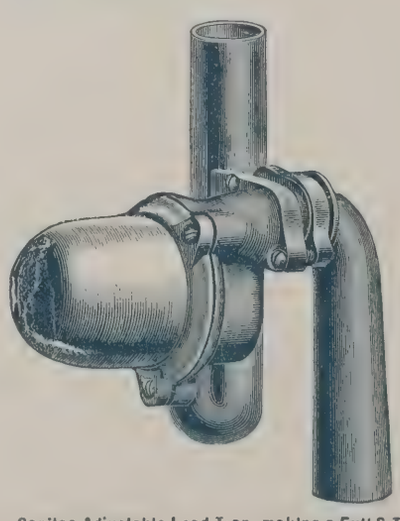


Fig 9. Sanitas Adjustable Lead Trap, making a Full S-Trap.

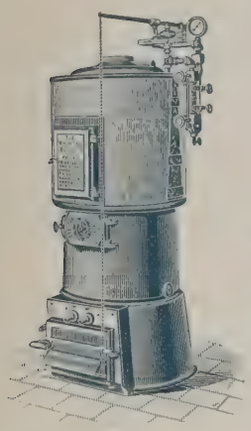


Fig. 11a. Sanitas Brass Trap.

Smith & Anthony Co., MAKERS Sanitas Plumbing Appliance.

48 to 54 UNION STREET, BOSTON.

56 BEEKMAN ST., NEW YORK. CHICAGO AGENCY, 217 LAKE ST.



VOLUNTEER
AND
ALL RIGHT
The Best and
ONLY
Self-regulating
Hot Water Heaters
on the market

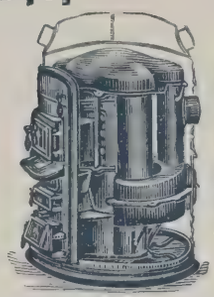
FOR STEAM HEATING
Manufactured by
The Wm. H. Page
Boiler Co.,
Norwich, Conn.

N. Y. Agents,
DUBOIS & DUBOIS,
61 Gold St.

S. B. SEXTON & SON,
ESTABLISHED 1839.
Original Patentees, Inventors and
Manufacturers of the
Baltimore FIRE-PLACE Heaters
Also Manufacturers of the Best
Stoves, Ranges and Furnaces.
Send for Testimonial Book
and be Convinced.



The original and most perfect fire-place heater ever made; so acknowledged by the trade and public.

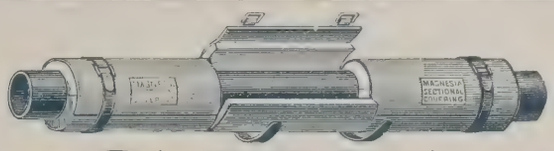


Large radiating surface, perfect combustion, economical in use of fuel, portable and brick-set.

S. B. SEXTON & SON,
Foundry, 511 to 527 W. Conway St. Store, 23 E. Lombard St.
BALTIMORE, MD.



ABSOLUTELY



FIREPROOF.



MAGNESIA





Sectional Steam Pipe and Boiler Coverings.

THE GREAT COAL SAVER.

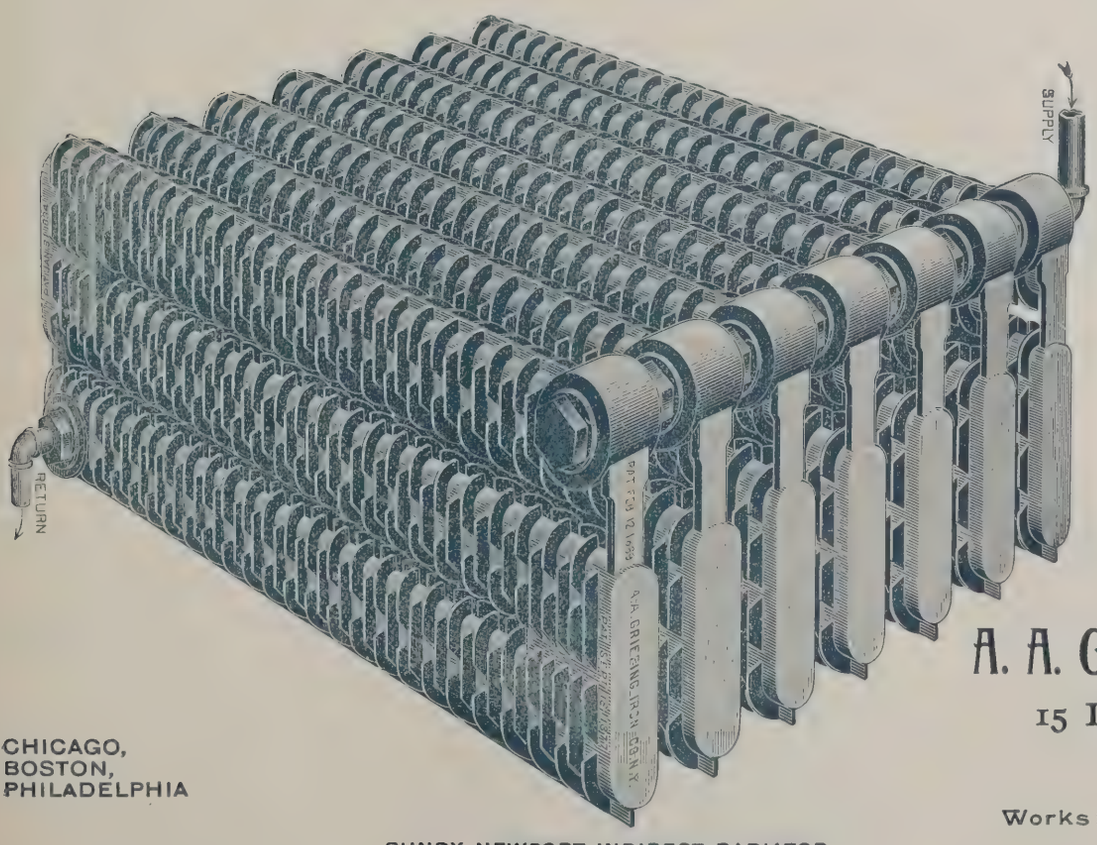
MANUFACTURED BY THE
Keasbey & Mattison Co.
Cincinnati: 114 West Second St.
Ambler: Pa.
Cleveland: 117 Water St.

SELLING AGENTS:
New York: Robert A. Keasbey, 54 Warren St.
Boston: S. C. Nightingale & Childs, 134 Pearl St.
Philadelphia: Macan & Co., 1420 Callowhill St.
Baltimore: Wallace & Bro., 432 East Pratt St.
Washington: Wm. B. Morgan, Builders' Exchange.
New Orleans: Delbert Engineering Co., 23 Union St.
Memphis: Symmes & Co., 192 Front St.

SELLING AGENTS:
Milwaukee: F. Sprinkman, 133 Sycamore St.
St. Louis: F. Bocler, 108 Walnut St.
Detroit: S. P. Conkling, 20 Atwater St., East.
Denver: C. W. Badgley & Co., 18th & Market Sts.
Salt Lake City: Utah and Montana Machinery Co.
Butte City, Mont.: R. W. James.
San Francisco: DeSolla & Deussing, 2 California St.

THE BUNDY

Newport Indirect Radiator ...



HAS a depth of 16 inches, large openings, all screw thread connections, no diaphragms to impede circulation, a gradual slant from feed to return, no air or water pocket, and is specially well adapted for hot water heating : : :

A. A. Griffing Iron Co.,
15 DEY STREET.
NEW YORK.

Works: Jersey City, N. J.

CHICAGO,
BOSTON,
PHILADELPHIA

BUNDY NEWPORT INDIRECT RADIATOR.

Mr. Chas. Onderdonk, of the Onderdonk Heating & Ventilating Co., Philadelphia, Pa., has gone to Indian Territory for a month for his health.

The United States Heater Co., Detroit, Mich., send us a very pretty colored page showing that the "Capital" and "Hecla" have been installed in almost every kind of a modern building, and that their cry is still Excelsior.

The business of John A. Scolley, 74 Myrtle avenue, Brooklyn, has increased so largely within the last year that in order to be more in touch with his out-of-town trade he has opened an office at 89-91 Centre street, New York, where Mr. U. G. Scolley and Mr. E. G. Munroe will be glad to see all of their old friends, and invite the trade in general to drop in and see them.

Col. E. N. Squires fresh from Geneva, via Washington, D. C., made us a call early in the month. We are glad to say the Colonel has almost entirely recovered from the bad fall he received last summer, and he remarked confidentally that the N. Y. C. Iron Works were running 15 hours a day, this being necessary to fill orders. We are also happy to announce that 20,000 Dunnings are now supplying the country with warmth, and the end is not yet.

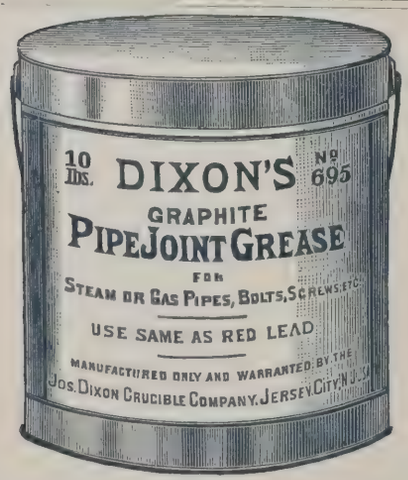
The New "Clycone" steam boiler manufactured by the Richardson & Morgan Co., of New York, is attracting much attention, as the results shown by it are very gratifying. The company state that with water from the main they have got up steam in 2½ minutes, while four minutes is common. Pea coal can be burned in this heater, and with such coal at two dollars a ton a nine-room house could be heated at less than seven cents a day. Investigate this boiler. Mention H. & V.

The Holland Radiator & Mfg. Co., 69 Centre street, New York, have on exhibition a new radiator on the fluted principle for window radiation. The columns are fluted and the sections separated. These radiators show very strong results in drawing air from the floor and creating a circulation. The same pattern makes first-class wall radiators extending only 2¼ inches from the wall. They are ornamental, presenting a handsome appearance, and are sold at a low price. The Holland company invite engineers to test these radiators against others.

Capt. D. P. Hughes. of the Standard Radiator Co., of Buffalo, is always a welcome visitor to New York. He dropped in on us unexpectedly the other day with his hearty "Howdy," and informed us that the "Standard" was all sold out. Continuing, the captan said: "Notwithstanding that we have the largest individual radiator plant in the world, with a capacity of three million feet a year, our frends have bought all we could make. We fully appreciate the trade that has come to us and next year we shall be in better shape than ever to supply their wants."

That was a unique idea of George Downe's in sending out the announcement of the Ideal Boiler Co., of Chicago, of which he is general manager, touching upon the push-nipple connection that is one of the strong points of the "Ideal." We refer to the card headed "In the Push," and which shows in the right hand corner a sectional cut of this connection, while in the lower left hand the sectional cut of the boiler is prominent. A little cord is attached, so that the card can be hung up in any convenient location, and be referred to at once when showing off the fine points of the Ideal.

(*Continued on page xvii.*)



FAR BETTER AND CHEAPER THAN RED LEAD

Makes a tighter joint than red lead, that can be opened with perfect ease many years after.

Invaluable for all steam, gas and water piping, and equally useful for smearing gaskets on flange joints of meters, traps, and for bolts, screws, etc.

JOS. DIXON CRUCIBLE CO.,
JERSEY CITY, N. J.



New York Office, 36 Park Place.

20,000 BOILERS

Just Think

what a line those would make if placed in a row

Think Again!

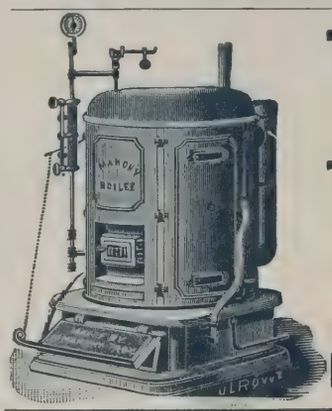
The 100,000-hp. that we are going to use from Niagara will only heat electrically 7,000 houses,

But the 20,000 Dunning Boilers are heating 20,000 Buildings.

We want to heat more.

We still have a few catalogues left. They tell you all about the DUNNING.

New York Central Iron Works Co.,
298 Exchange St., Geneva, N. Y.



THE MAHONY BOILERS.

For Steam or Hot Water.

THOUSANDS IN USE,

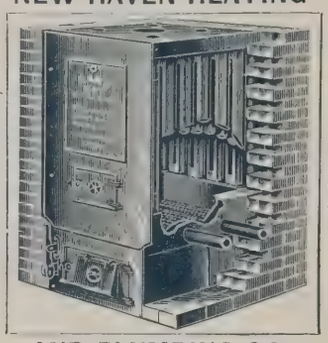
And all Giving Satisfaction.

SEND FOR CATALOGUE.

M. MAHONY, - Troy, N. Y.

NEW HAVEN HEATING

NEW HAVEN, CONN.



AND PLUMBING CO.

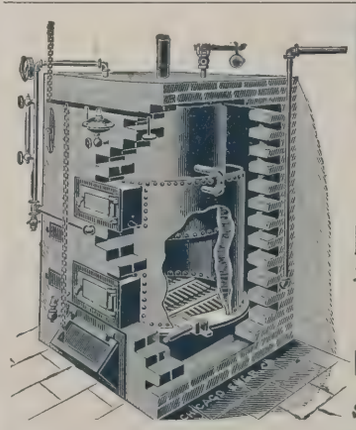
RAPID

Hot Water Heater

Selling Rapidly
To the Trade Only.

Money In It || For You.

Send for Catalogue, Price List and Discount.



THE IMPROVED

HAXTUN BOILER

FOR STEAM AND HOT WATER HEATING.

ECONOMICAL. *No Tubes to Clog Up.*

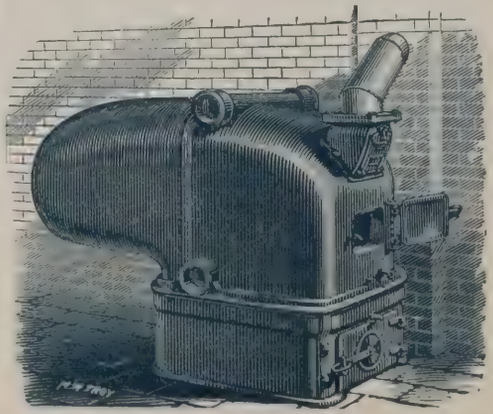
Magazine with Front Feed—can use HARD OR SOFT COAL.

BEEN IN SUCCESSFUL USE 18 YEARS.

MADE BY
KEWANEE BOILER CO., KEWANEE, ILL.

Chicago Office, Cor. Dearborn and Lake Streets.

Send for "Haxtun" Catalogue No. 2.



HITCHINGS & CO.,
233 Mercer Street, New York.

ESTABLISHED 1844.

Hot Water Heating Apparatus

for Greenhouses Conservatories, and Dwellings.

ALSO

WATER HEATERS FOR BATHS.

5 Styles of Boilers, 24 Sizes.

Send 3 cents postage for catalogue.



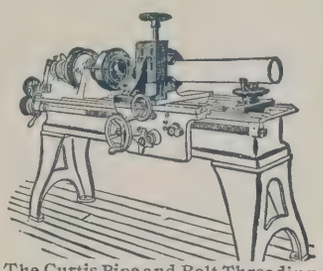
"WHERE ARE WE AT"

is what a few people were saying on November 7th. You will say the same thing if you do not put improved up to date pipe cutting and threading machinery in your shop. We make a specialty of saving you time, money and labor, in the cutting and threading of pipe. Allow us to send you our catalogue. We manufacture

Forbes' Patent Die Stock, Pipe Cutting and Threading Machine for Hand or Power. Also Pipe and Bolt Threading Lathe Attachment.

CURTIS & CURTIS, 46 Garden Street, Bridgeport, Conn.

Portable Hand Machines we make enable one man to cut and thread 8-inch pipe.



The Curtis Pipe and Bolt Threading Attachment for Lathes.

The new science of "Oikology," or the science of home life, has to do with the physical side of the house, and concerns itself with such subjects as plumbing, heating, ventilation, etc.

The Marion Heating Co., of Marion, Ia., has been organzied to manufacture furnaces. O. M. Boyles, formerly with Henry Darts' Sons, of Rock Island, and Hiram Robinson, formerly with the Davenport Steam Heating Co., are members of the new company.

Mr. T. H. Genells, of St. Louis, Mo., for the Modern Heating Co., of that city, on one day of last week, closed contracts to heat 19 different houses in St. Louis by hot water. These contracts were taken in sharp competition with hot air furnaces. The Ideal Boiler, manufactured by the Ideal Boiler Co., of Chicago, will be used in all of the above contracts.

On Friday, Oct. 12., the Schneider & Trenkamp Co., of Cleveland, O., tendered their traveling representatives a complimentary banquet at the American House, that city, which was greatly enjoyed by all. The company are now actively at work introducing "Reliable" goods for 1895, and with the general good trade we should have from this time on, will undoubtedly get their share.

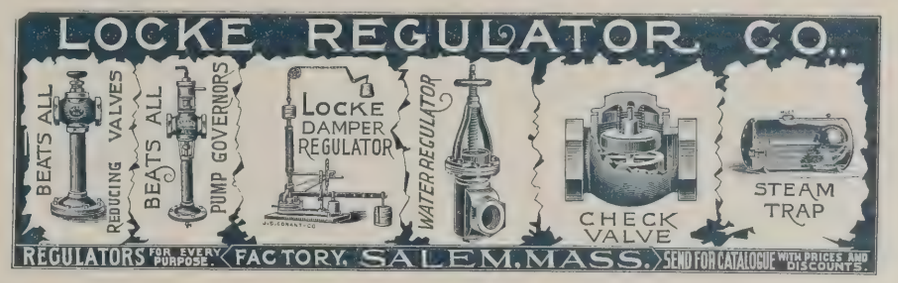
W. F. Sauber, engineer of the steamer W. H. Gratwick, writes from Cleveland, O., to the Buffalo Forge Co., as follows: "The forced draught you put in the steamer W. H. Gratwick No. 2 is a complete success. We have not been able to get the slack coal, and have mostly burned lump, and I find a saving of more than ten per cent in better combustion in forced draught against natural draught."

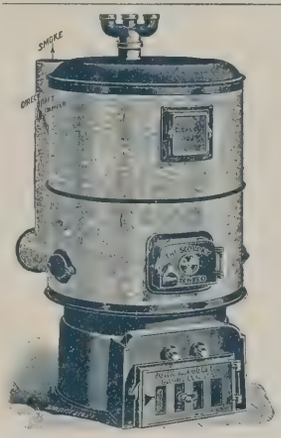
We have received from the Philadelphia office of Randolph & Clowes a souvenir of the United Association of Journeymen Plumbers, Gasfitters, Steam Fitters and Steam Fitters' Helpers, Local Union 123, of Philadelphia. The roster of the local is complete and pictures of the officers, with a short history, is an interesting feature. The rules and regulations governing house drainage, ventilation, etc., of the city of Philadelphia is given complete.

An industry of far reaching importance, says the Manufacturers' Record, has just been inaugurated in Georgia, near Demorest, White county. In the midst of extensive asbestos deposits has been built a plant for preparing the fibre for market. After several years experimenting to secure proper machinery, the plant is now completed, and has commenced operations with a daily output of from 5 to 30 tons of finished material. It is estimated hat the quantity of asbestos in sight will keep he plant busy for a long term of years.

The Foster Engineering Co., Newark, N. J., report that among recent orders received for their pressure regulators, to be applied to dynamo engines, are two 4-inch for the U. S. battle ship "Texas;" one 5-inch for the U. S. armored cruiser Brooklyn, one 3-inch and one 4-inch for the U. S. armored cruiser Indiana, five 7-inch for the Providence (R. I.), Steam Engine Co., two 8-inch for the Corliss Engine Co., Povidence, R.I., an d on 4-inch for the Western Union Telegraph Co.'s buelding. The latter is to deliiver steam to three dynamo engines, and to meet specifications is required to maintain within one pound a uniform delivery pressure of 45 pounds regardless of change of initial or boiler pressure, which ranges from 6 to 100 pounds.

(*Continued on page xviii.*)





The Scollay Hot Water Heater

For Warming DWELLINGS, STORES, OFFICES, CHURCHES, PUBLIC BUILDINGS, &c.

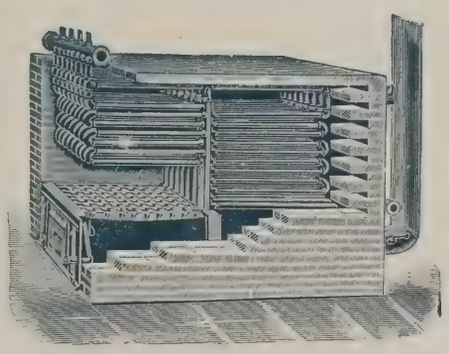
Also Boilers specially constructed for Greenhouses, Conservatories, Baths, Laundries, &c. . . . . .

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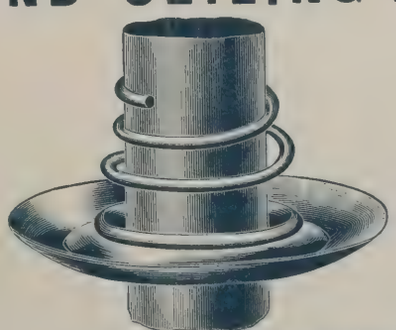
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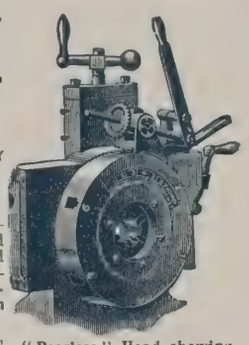
A few weeks since the St. Louis School Board determined to make an investigation of the claims made by the manufacturers of the Buffalo Fan System, telegraphing to school boards at Denver, Col.; Colorado Springs, Col.; Salt Lake City, Utah. From each a most favorable response was received, stating that the system was giving excellent satisfaction, both as to economy of fuel and perfect heating and ventilation.

The S. Wilkes Mfg. Co., of Chicago, write us as follows: "Business is very good, having just at present about all we can do, and the month of August the sales were more than double those of last year, and one of the largest months the company has ever had, and have reached a wider territory, with the Wilkes heaters, than ever before, and this month promises to come up if not to exceed it. Among the later sales have been a large Wilkes hot water heater for the new headquarters at the United States Military Academy, at West Point, N.Y.; two large heaters put up on the twin system in the new residence for J. S. Jones, of H. D. Turney & Co., Chicago, at Granville, Ohio; one for Dr. Charles Zaremba, at Riverside, Ill., and have shipped heaters to the Jas. Robertson Co., Winnepeg, Manitoba, Burlington, Vt., New York City, New Orleans, and a large trade from St. Louis, Milwaukee, Cleveland, Chicago, and other points, and many of them the larger sizes of heaters for heating residences, green houses, etc.

A. B. Franklin & Co. of Boston, have completed the work of remodelling the heating and ventilating equipment of the Pleasant Street School at Worcester, Mass. The old furnaces, large and small, have been torn out, also the old stoves that supplied heat to some of the fourteen rooms. Heat will now be supplied by hot air forced into the rooms through stacks and flues, the air being heated and draught caused by steam pipes in the stacks. Fresh air will be forced into the rooms from a point near the ceiling, and the exhaust air will pass out near the floor. Three new Stewart boilers for heating apparatus have been put in. In the basement are rooms, about 10 by 12 each, inclosed by brick walls, and containing coils of steam pipes connected with the boiler. Large ducts have been provided to admit cold air from outside the building directly upon the steam coils. Ventilating ducts lead from the brick rooms and steam coils to each room in the building. The ducts enter the rooms near the tops of the walls, and are to be under the control of the teacher in each room. A foul air shaft is arranged between the two rooms, containing steam coils, and is supplied with hot air from a small upright boiler to carry off the foul air. The water closets and all their fixtures are new and are equipped with an automatic flushing apparatus which operates every five minutes. Ducts from each closet connect with the foul air shaft. The boys' urinal stalls are of slate and drain directly into the sewer, and steam coils aid the escape of foul air. The sanitary and ventilating apparatus are the Kendall system.

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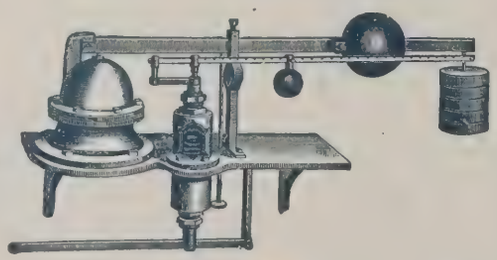
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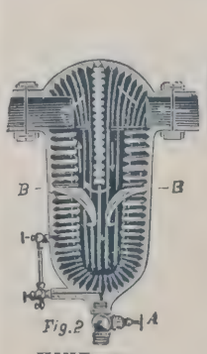
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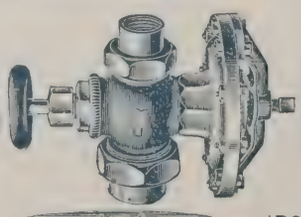
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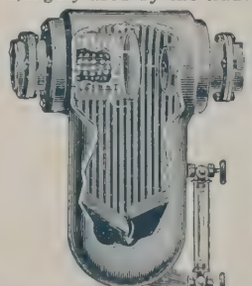
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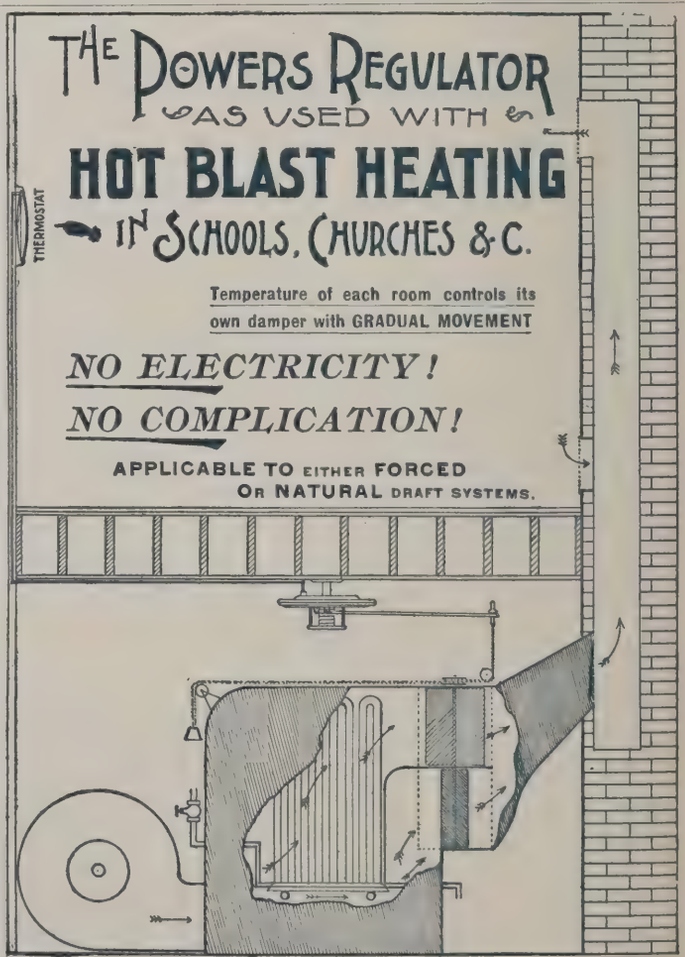


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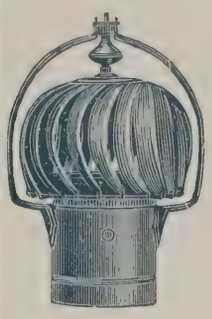
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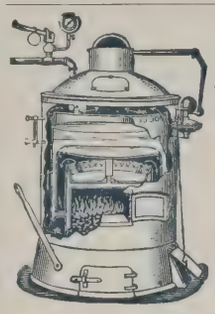
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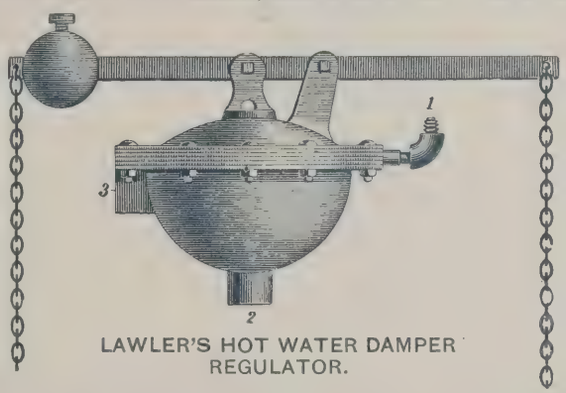
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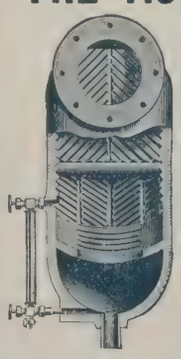
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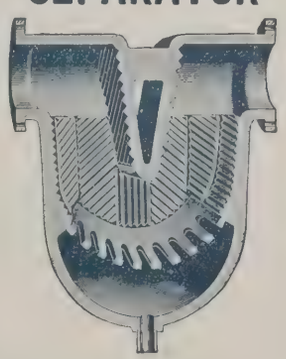
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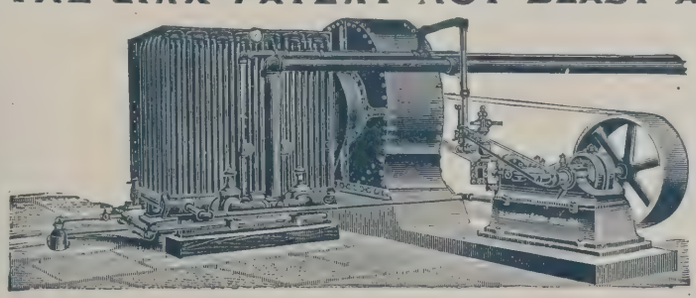
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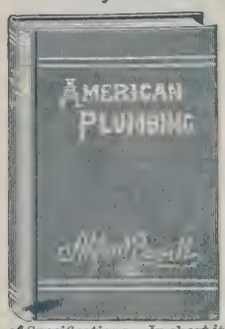
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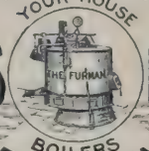
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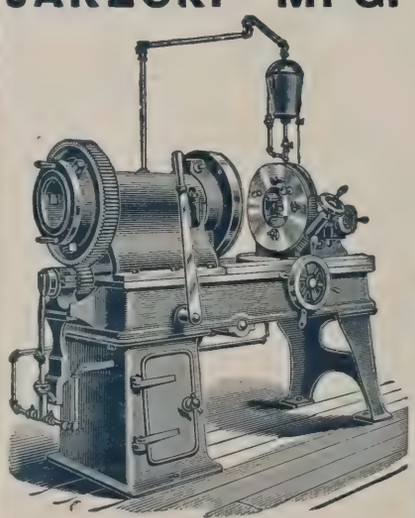
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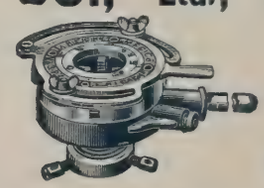
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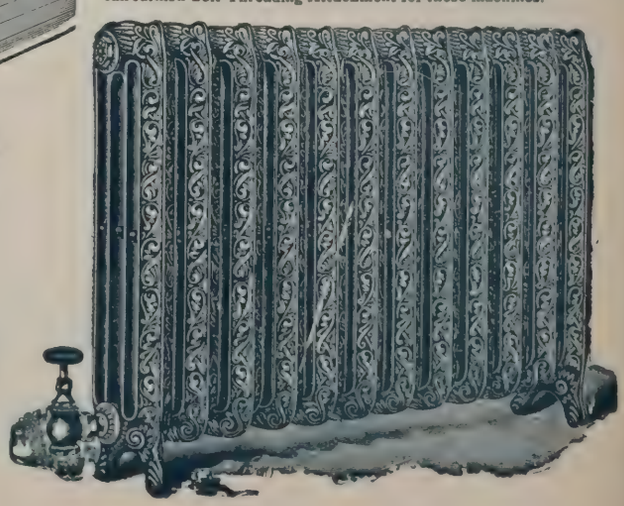
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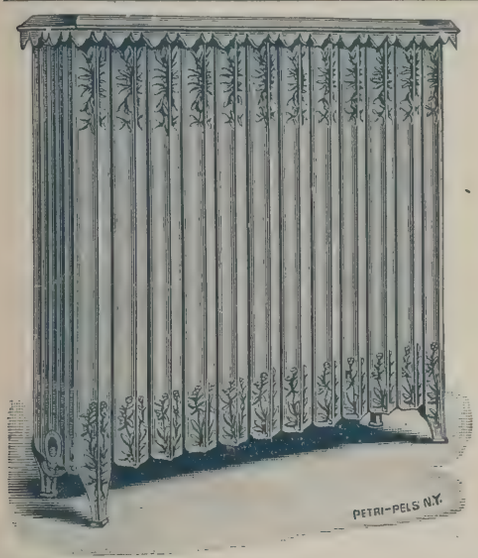
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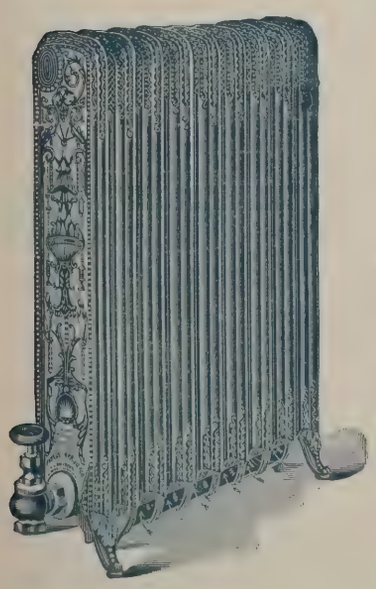
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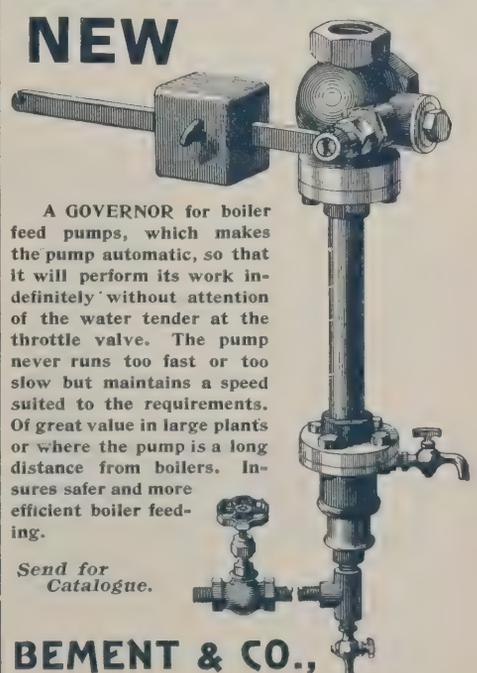
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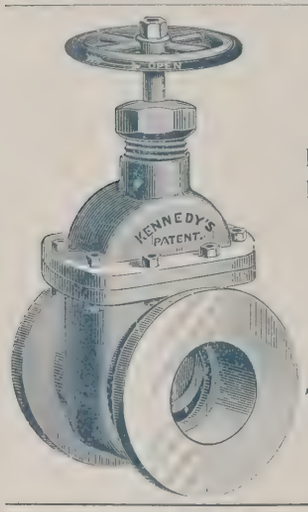
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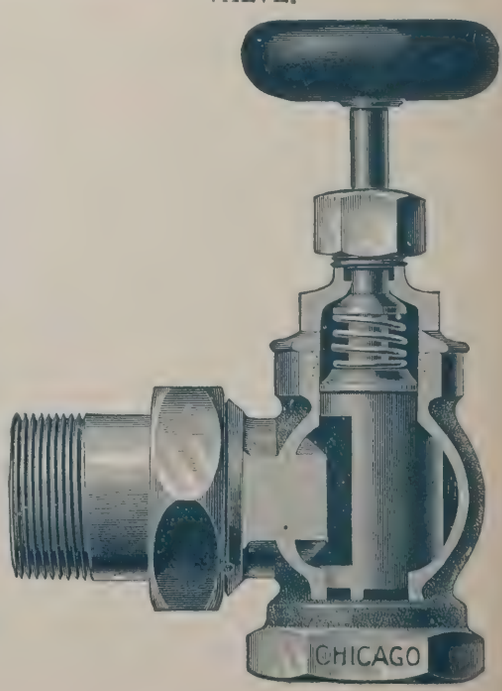
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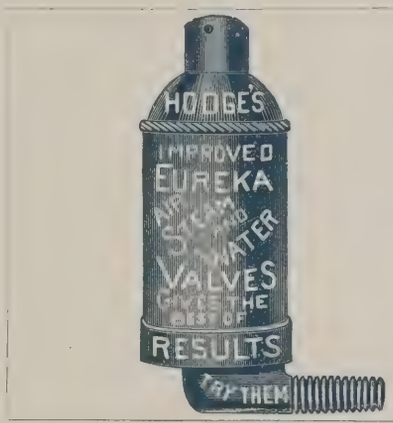
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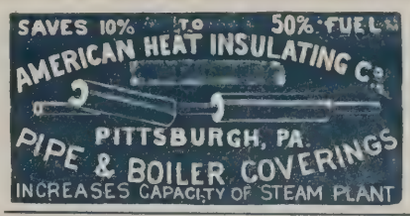
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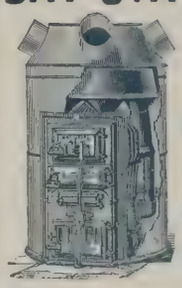
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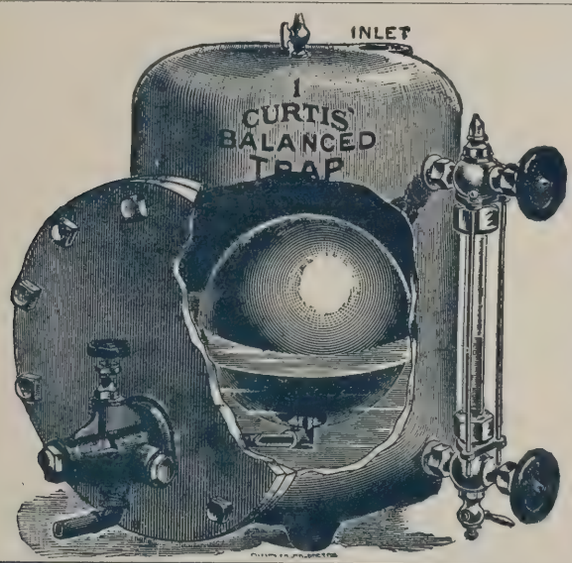
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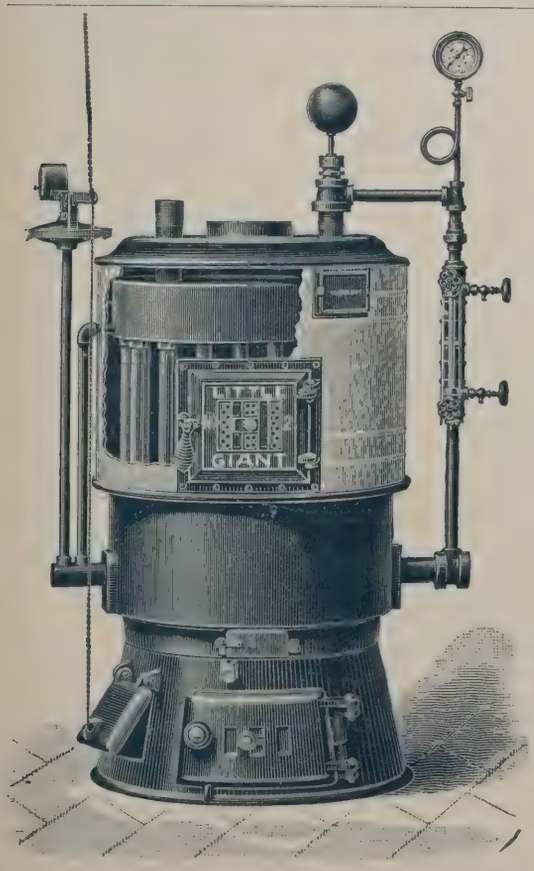
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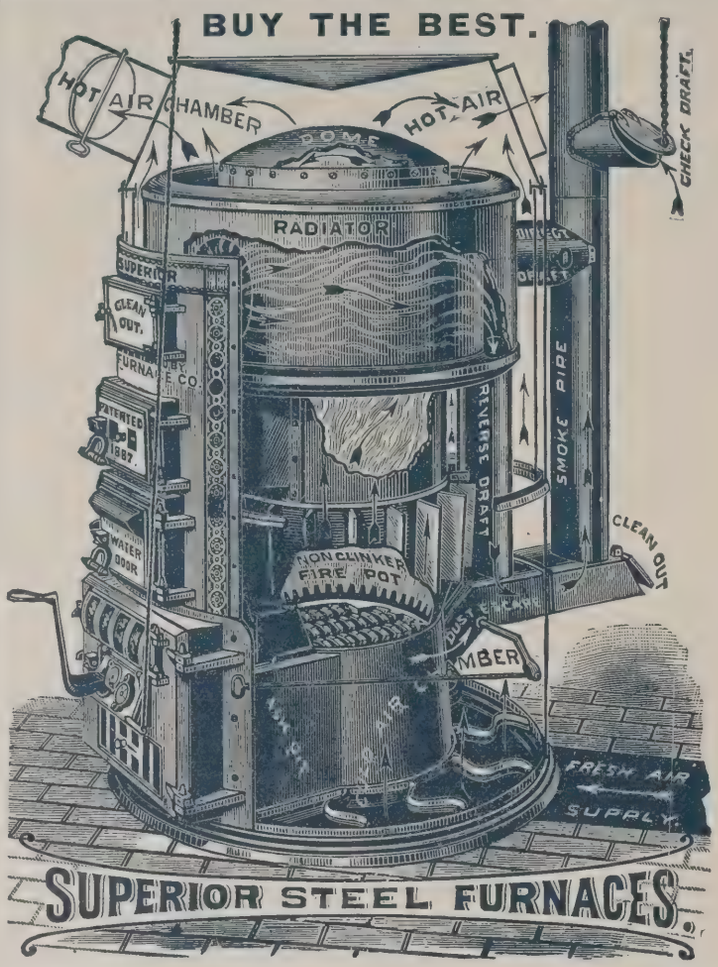
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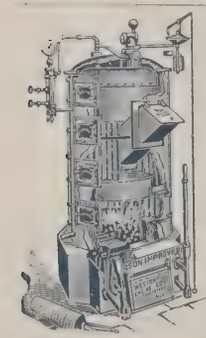
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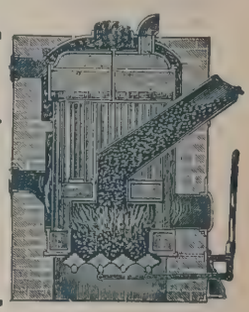
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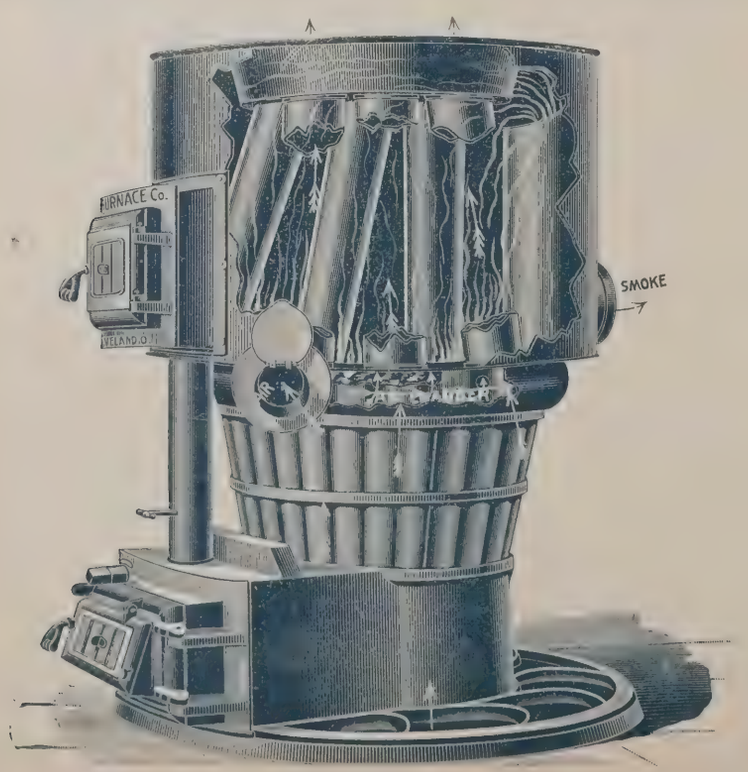
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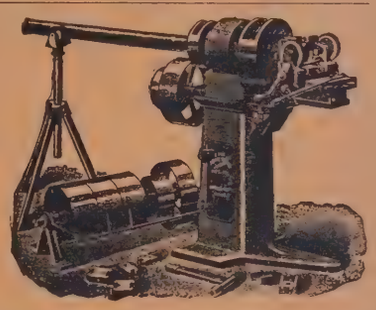


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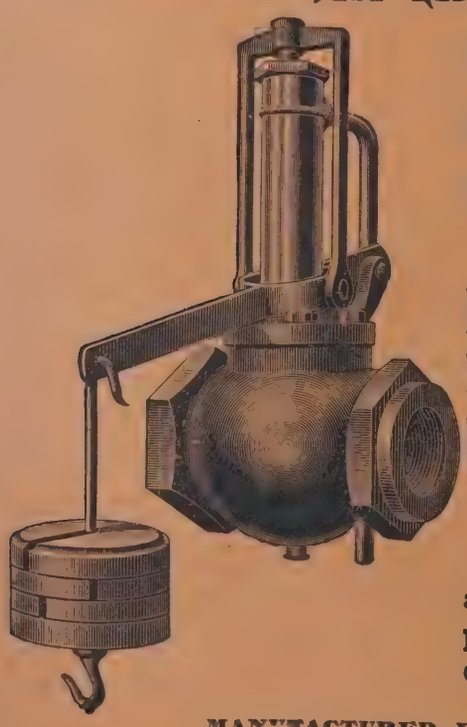
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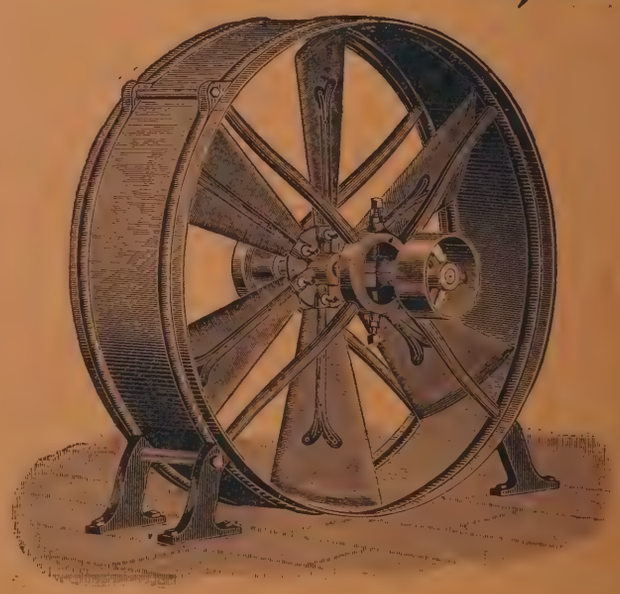
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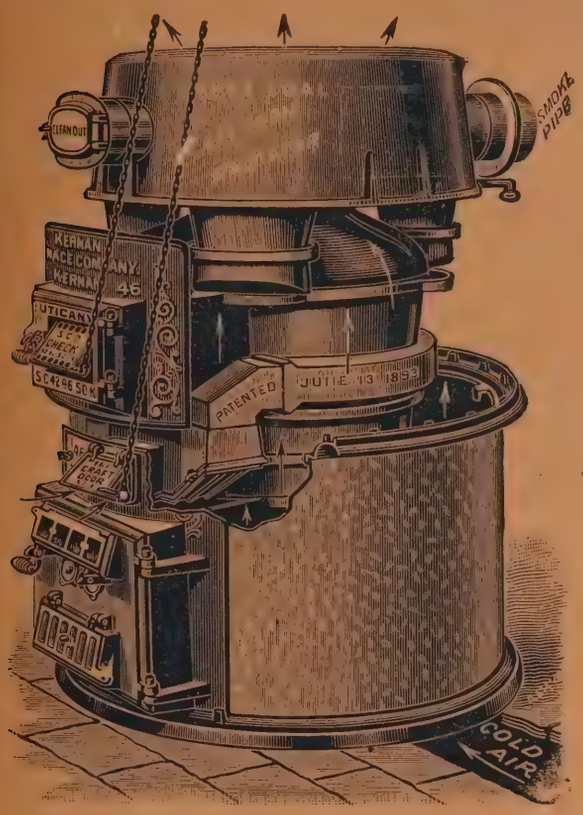
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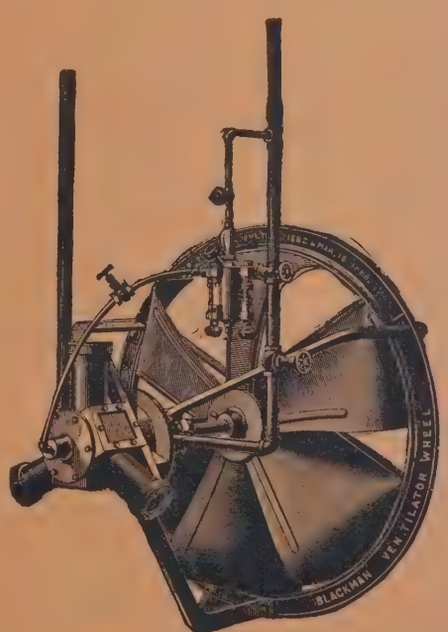
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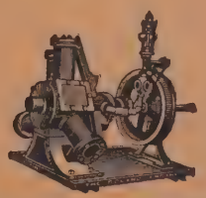
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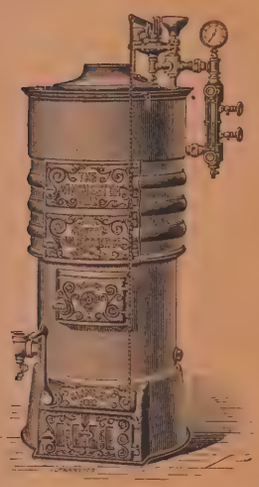
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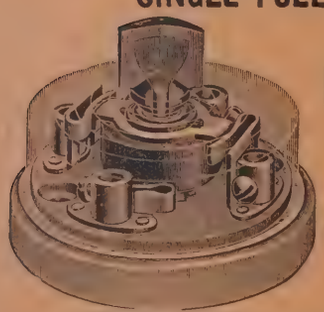
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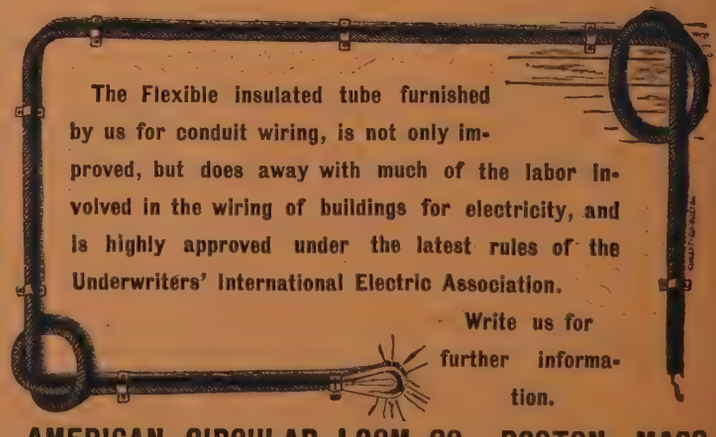
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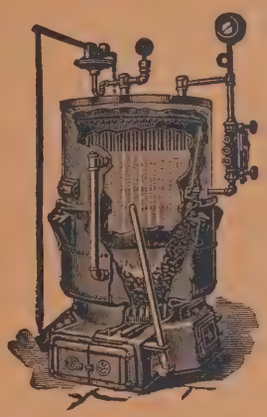
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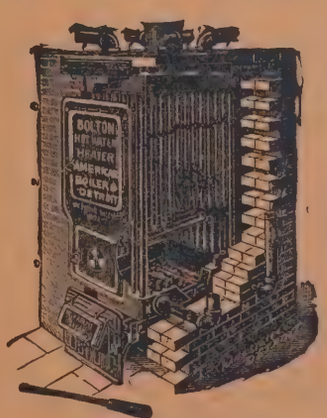
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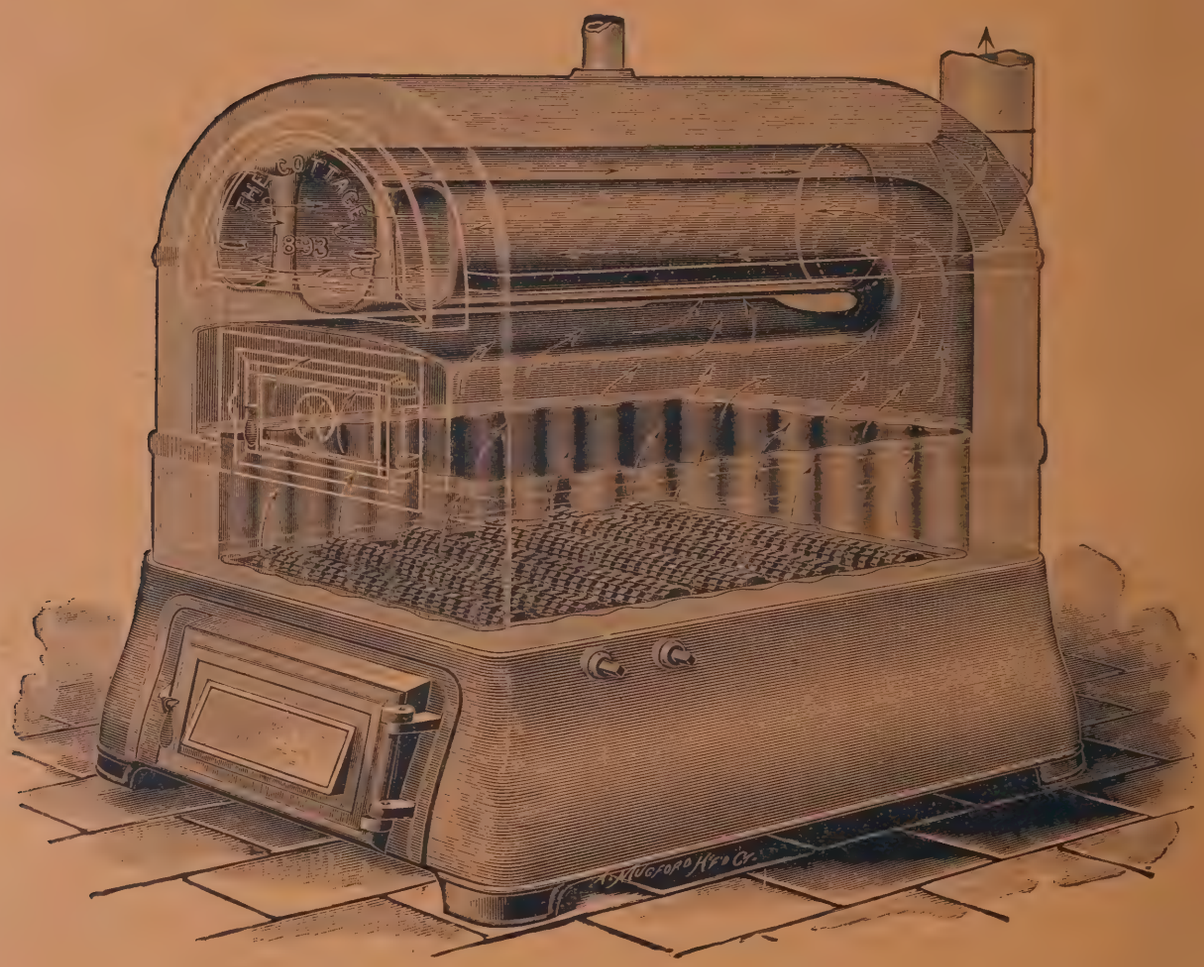
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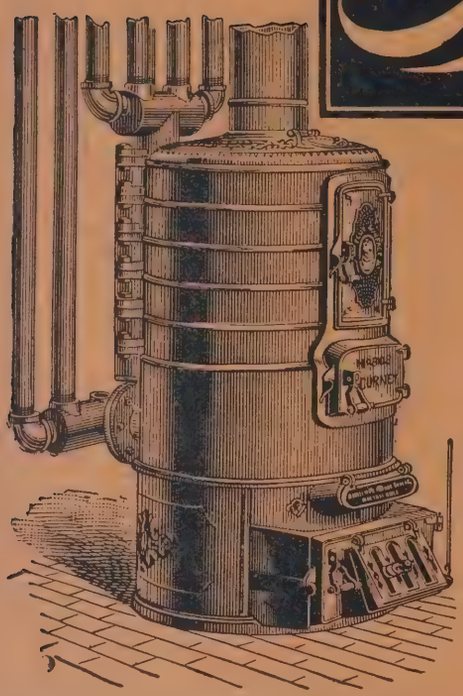
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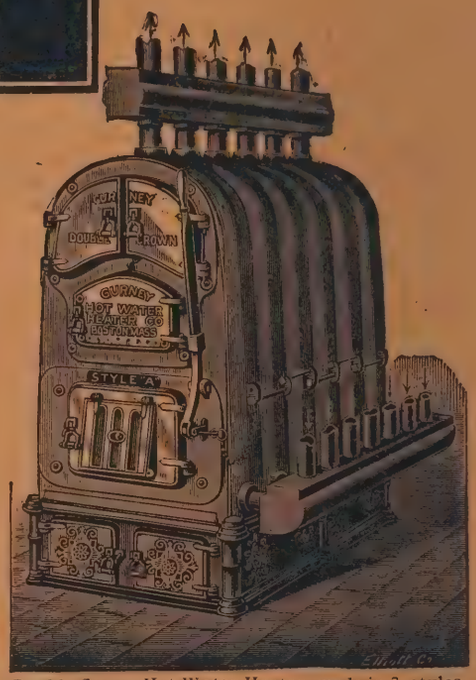
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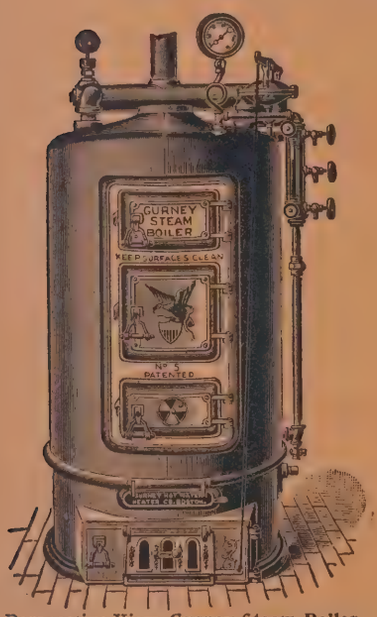
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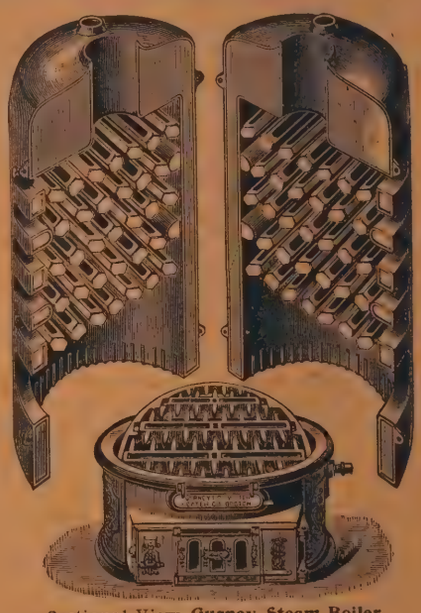
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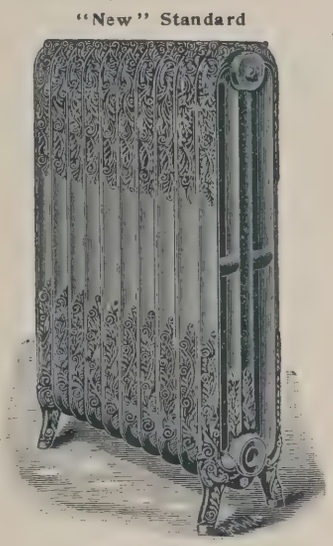
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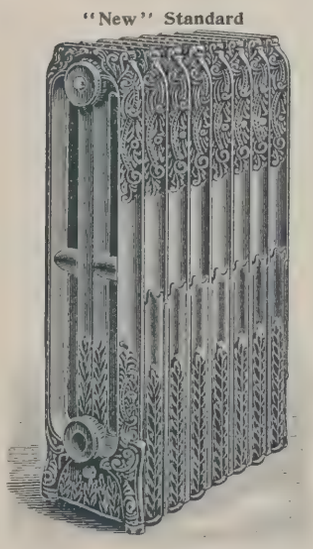
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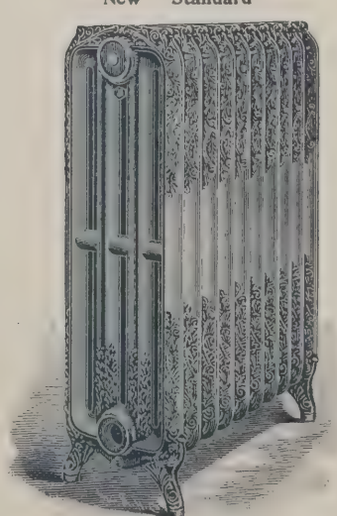
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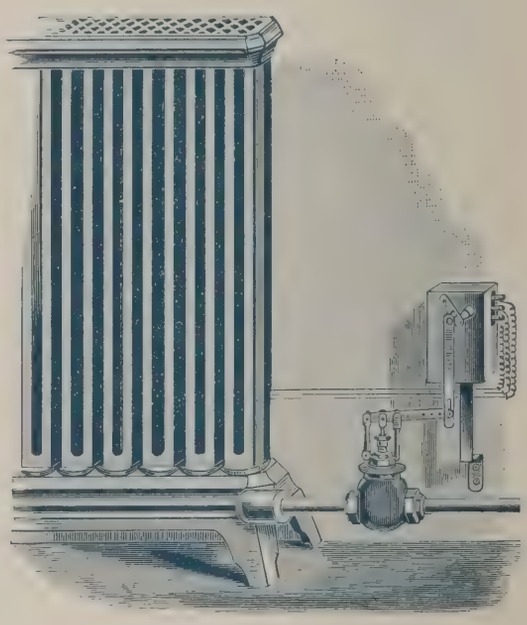
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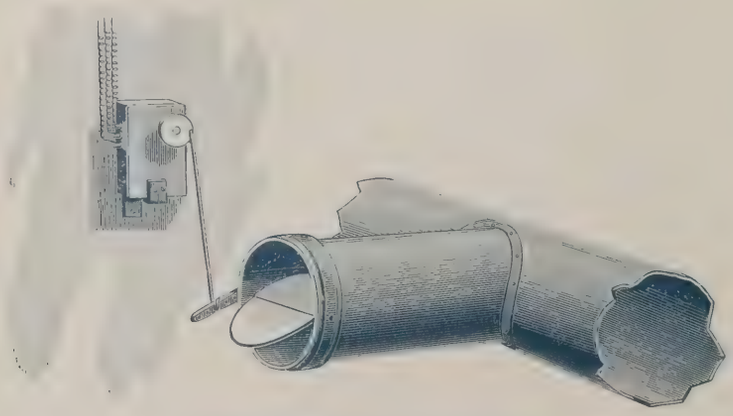
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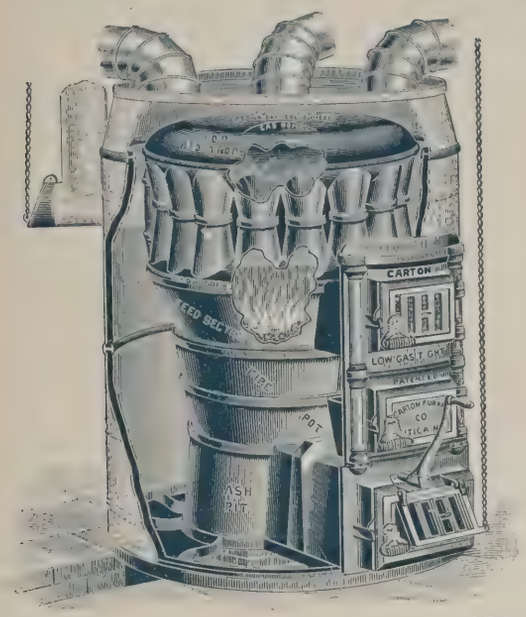
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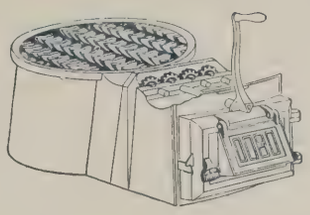
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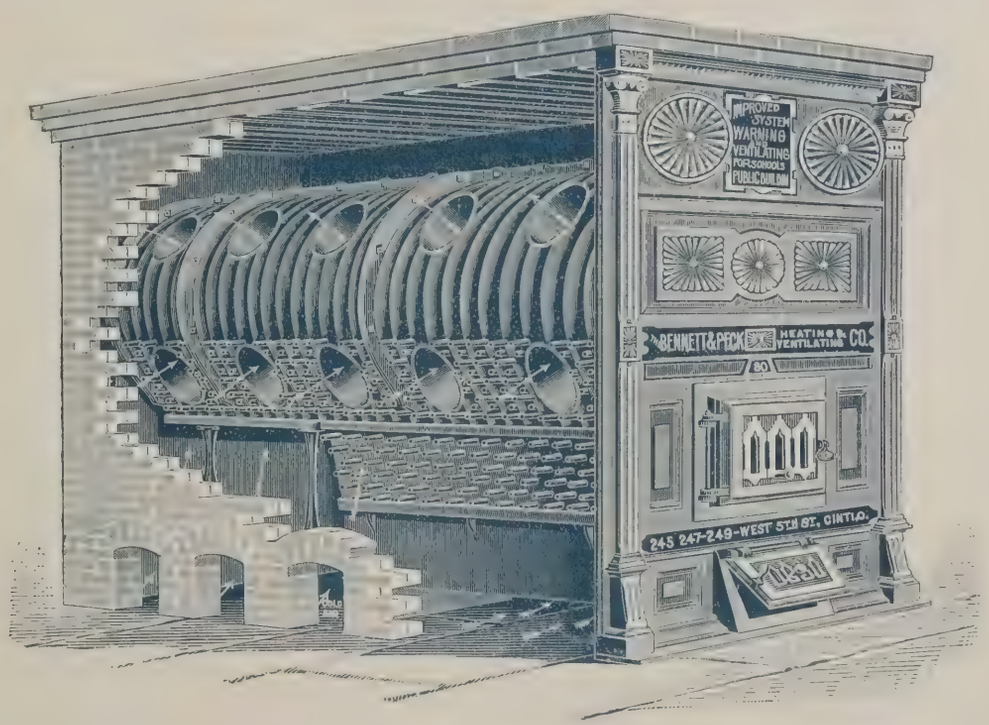
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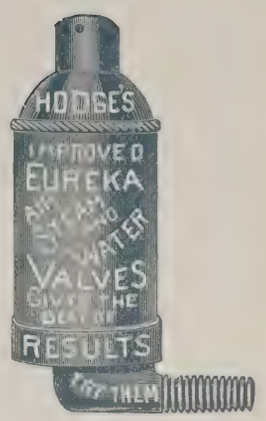
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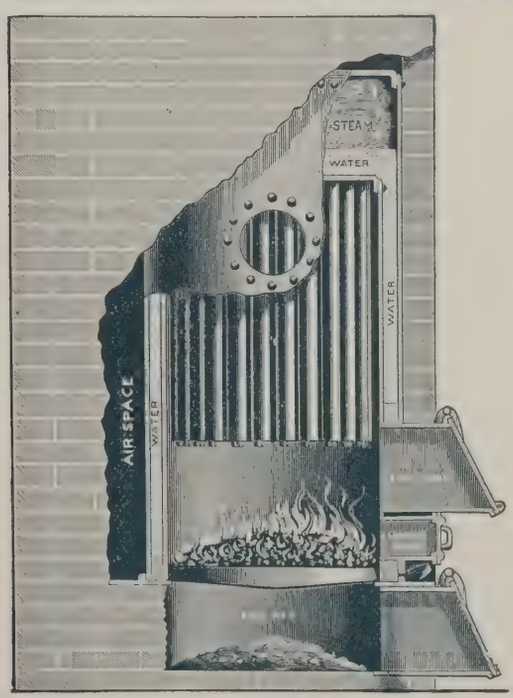
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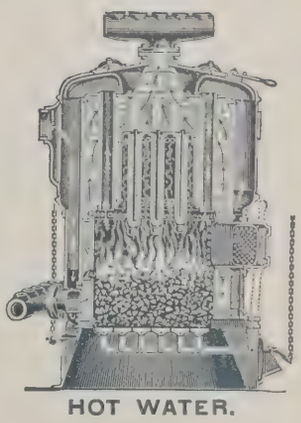
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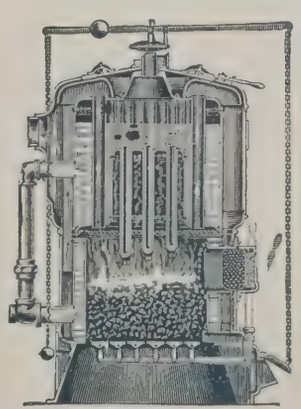
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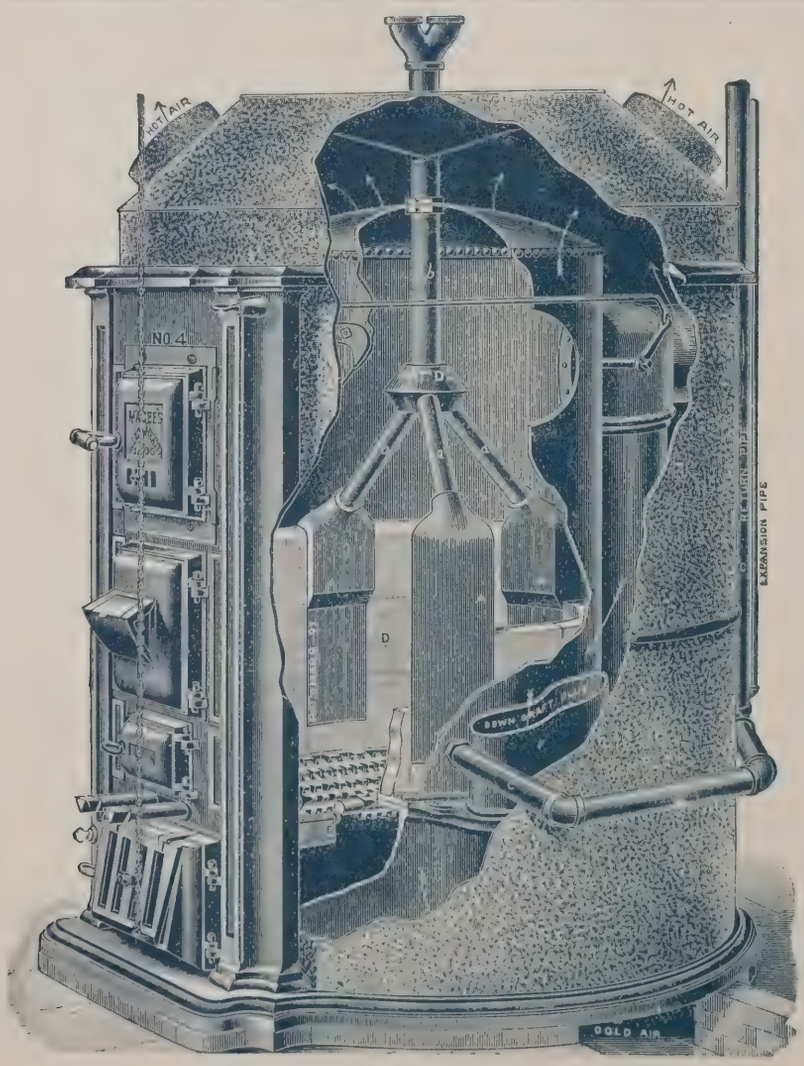
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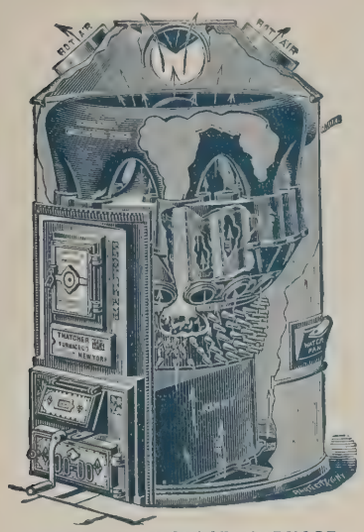
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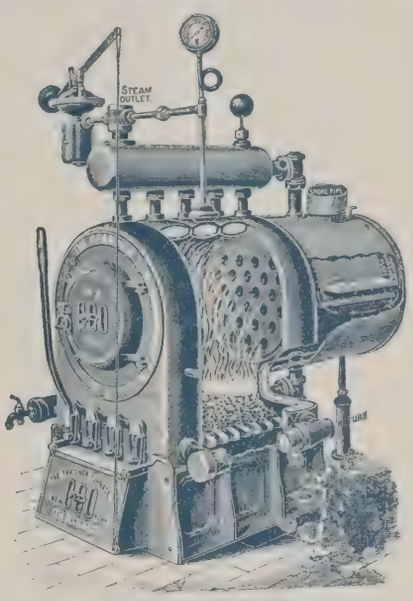
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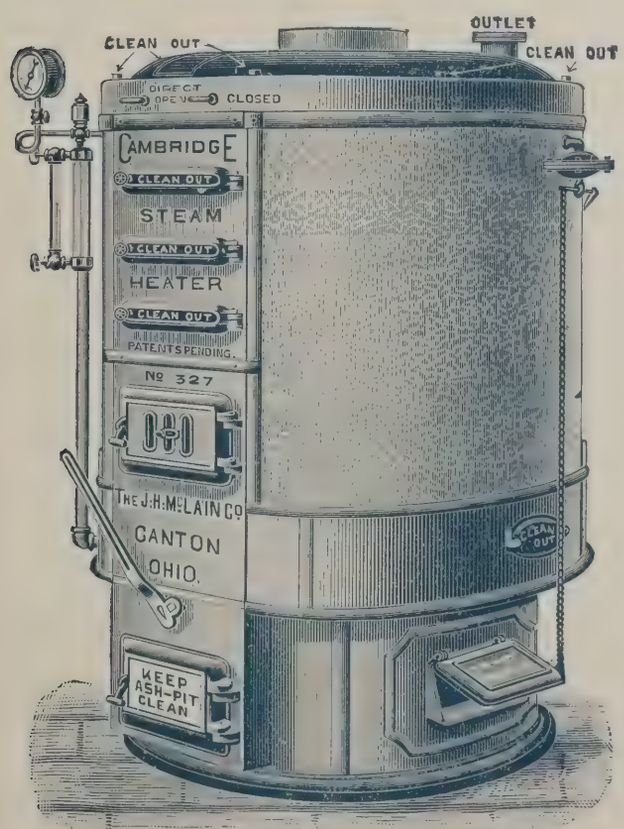
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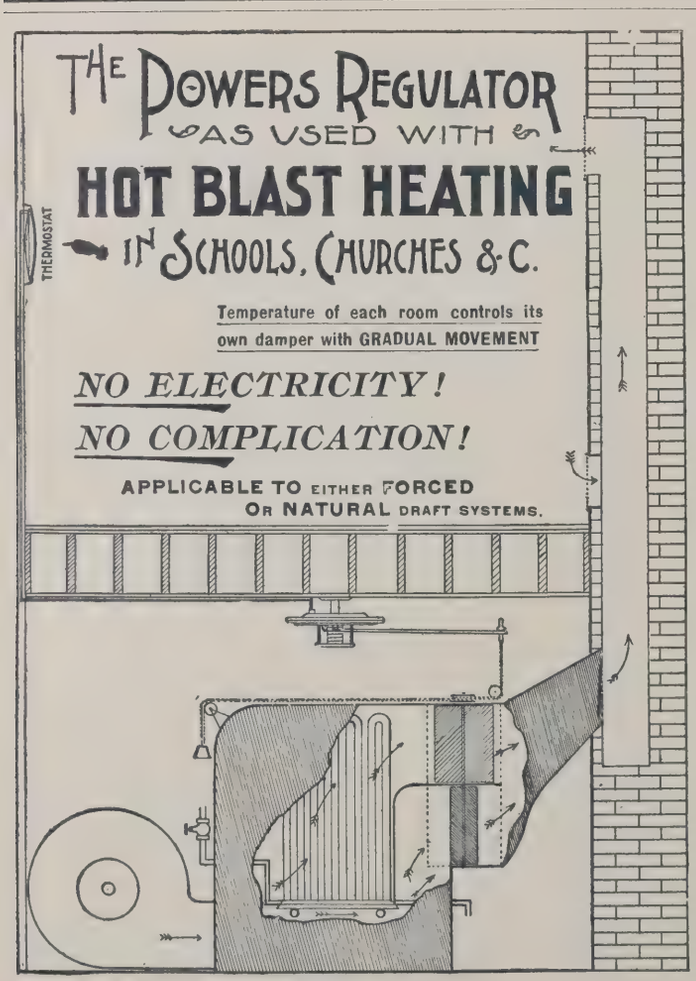
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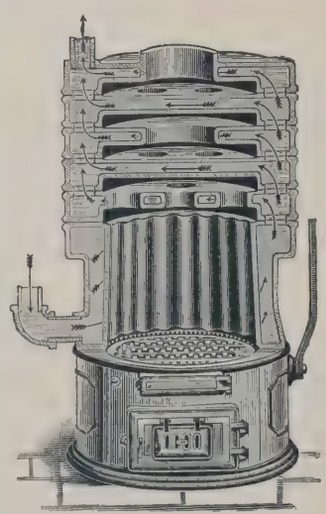
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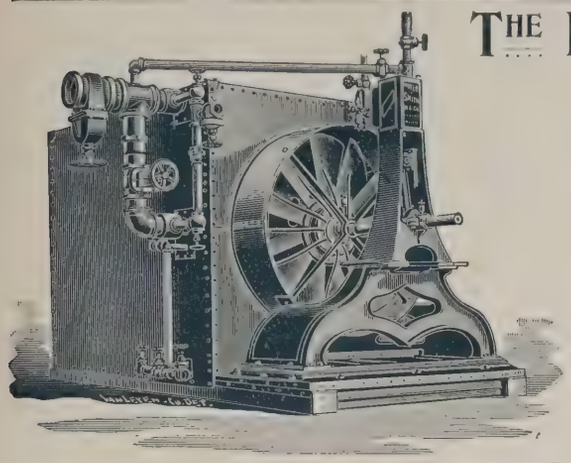
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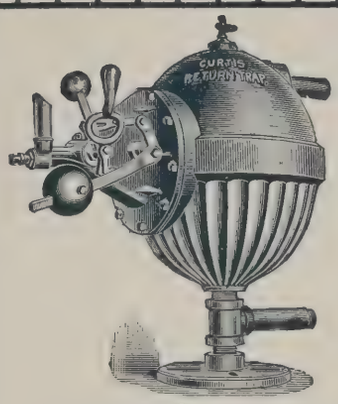
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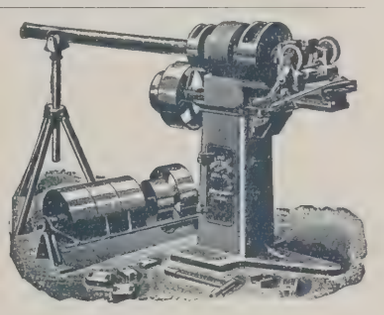
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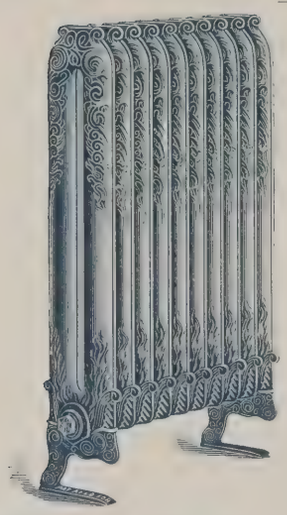
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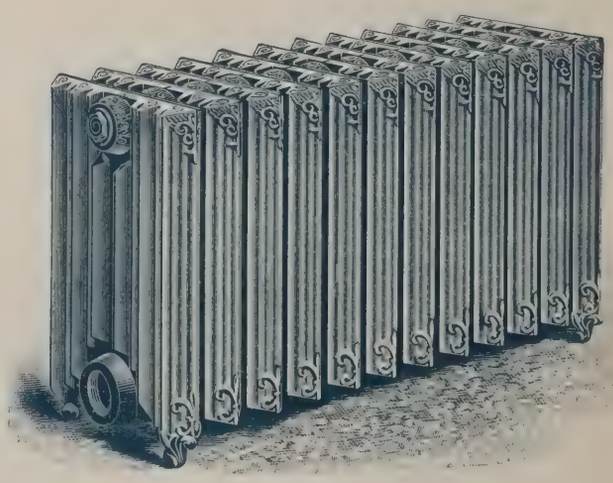
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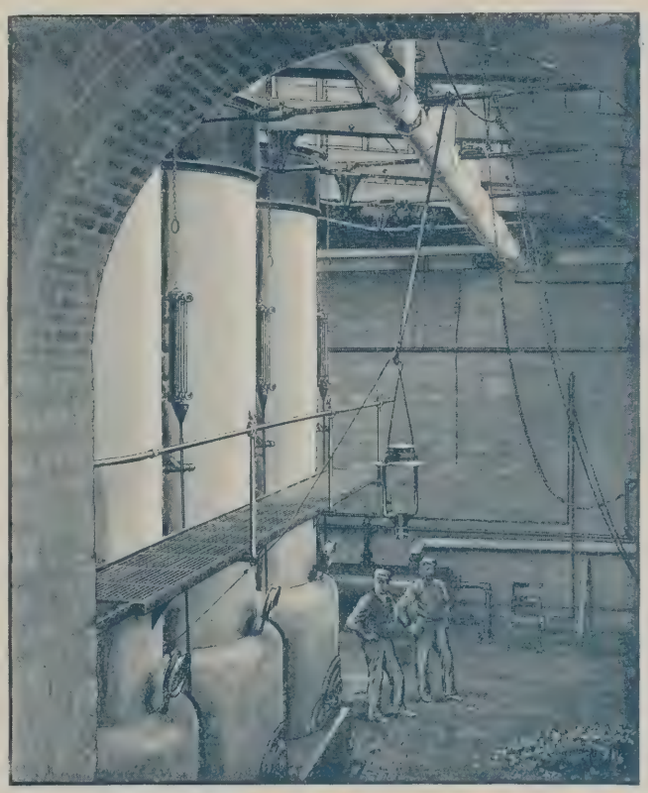
DETROIT AND BUFFALO.

Heating and Ventilation

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Heating of Madison Barracks.

Madison Barracks are located at Sackets Harbor, N. Y., the buildings, most of which are shown by the lower of the two engravings on this page, being situated on an exposed bluff on the eastern extremity of Lake Ontario, so that provision for an occasional temperature of at least 30 degrees below zero was one of the many severe conditions to be met in the construction of the heating plant, of which the following is a brief description. The work called for the efficient heating, under the rigorous climate of a northern New York winter, of four separate barrack buildings from one central plant, the extremity of the building furthest away being 1,700 feet from the boilers, and for more than half of this distance it was necessary to carry the main steam and return pipes above ground and across open and exposed territory.



BOILER PLANT, MADISON BARRACKS.

Three Manning boilers of about 150 horse-power each, shown in perspective by the upper of the two engravings on this page, and in plan by Fig. 1, were set in the basement of the boiler house below the ground line. From these boilers an 8-inch main runs to the extremity of the building, where it is divided, one 6-inch pipe running to the building west of the main supply, and one 5-inch pipe to those on the east side. The 5-inch pipe is carried about 100 feet through a brick culvert, Fig. 2, to the first barrack building.

Running the entire length of this barrack building, side lines are carried off to supply radiators and coils, while the main pipe, reduced to 4 inches, is carried for a distance of 300 feet above ground to the second barrack building marked B, shown in the general view on this page, and in the general plan view of the plant, Fig. 3.

At this point the pipe again branches, and a 3-inch pipe is carried above ground for a distance of about 700 feet to the third barrack building marked C (see Fig. 3, and the general view). In this building the main line of pipe is carried for a distance of over 500 feet to the further extremity of the building at the point marked D.

The return pipe follows the general line of steam pipe back to a receiving tank in the boiler room, where the water of condensation is automatically pumped back into the boilers.

The method of protecting the pipe is as follows: First, one cover of pure asbestos fibre; on this two layers of asbestos mixture, the whole being thoroughly wired, and about 2 inches in thickness. The smaller pipes are wrapped separately and securely with three thicknesses of asbestos sheet ⅛ of an inch thick, and carefully wired.

Between the buildings the pipe is carried in a wooden box 30 inches square made of 2-inch pine plank. The pipe in the box is fitted at frequent intervals with expansion joints, Fig. 4, and is carried on self-adjusting chairs and rollers.

After applying the asbestos covering to the pipe the box was filled with dry sawdust and securely battened. The return pipes were covered in the same manner. The pipe in the culvert was covered with an extra thickness of asbestos, being carried on rollers and supported as indicated by Figs. 5 and 6. Through the basement of the barrack buildings the main steam and return pipes are carried in brick



GENERAL VIEW BARRACK BUILDINGS, MADISON BARRACKS, SACKETS HARBOR, N. Y.

trenches which may be filled with sawdust.

From the report of the working of the plant at the end of the first winter, we cull the following: "It has been running interruptedly since it was first started without accident, and with the use of only two of the three boilers, the amount of coal used varying from 5 to 8 tons per day. A pressure of 35 pounds is required on the boilers, which is reduced to 20 pounds in the boxes at the further barracks. That the installation of the pipe in the boxes is as near perfect as possible is demonstrated by the snow and ice which have remained on top of the box until spring."

The officer in charge adds that the character of the workmanship and material is exceptionally high class and merits special commendation. The plant was put in by the Watertown (N. Y.) Steam Engine Co., the

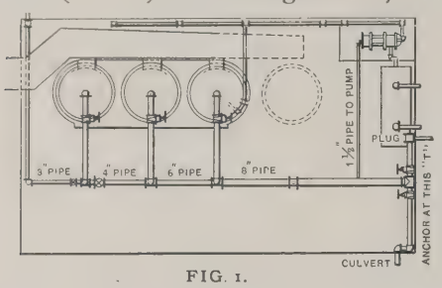


FIG. 1.

plans being prepared by Engineer Charles H. Fish, and the work done under the direction of Capt. Charles B. Thompson.

The power of any heating apparatus, says a well known heating engineer, depends to a very large extent on the area of the grate, or, in other words, the power to burn coal. Fuel must be burned to produce heat, and as the quantity of fuel burned must be proportioned to the space to be heated the area of the grate must also be proportioned to the amount of fuel to be burned. The heating surface of an apparatus should in all cases be proportioned to the size of the grate, and should never go below a ratio of 30 to 1, or, in other words, there should be at least 30 feet of heating surface for every foot of grate surface. The greater this ratio the greater the economy of fuel. The

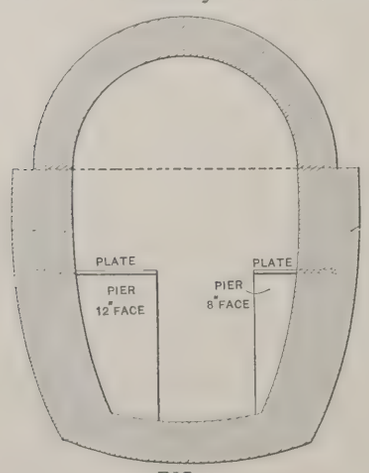


FIG. 2.

greater the proportion of fire surface in the total heating surface the better the results.

Pitting of Boilers.

In a recently published article on this subject, Mr. Olroy, a French engineer, says: Pitting is particularly likely to occur if a water very free from lime is used in a clean boiler. The pits take the form of conical, or, more frequently, spherical depressions, which are filled with a yellowish-brown deposit consisting mainly of iron oxide. The volume of the powder is greater than that of the metal oxidized, so that a blister is formed above the pit, which has a skin as thin as an egg-shell. This skin contains usually both iron oxide and lime salts, and differs greatly in toughness. In many cases it is so friable that it breaks with the least shock, falling to powder, whilst in other cases the blister detaches itself from the plate as a whole.

An analysis of the powder in the pits showed it to consist of 86.26 per cent of peroxide of iron, 6.29 per cent of grease and other organic matter, and 4.25 per cent of lime salts, the remainder being water, silica and aluminum. The skin over the pits was found to contain 38 parts of calcium carbonate, 12.8 parts of calcium sulphate, and 32.2 parts of iron oxide, with about 8 per cent each of magnesium carbonate and insoluble matter. Feed water heaters often suffer badly from pitting, particularly near the cold water inlet, and in boilers the parts most likely to be attacked are

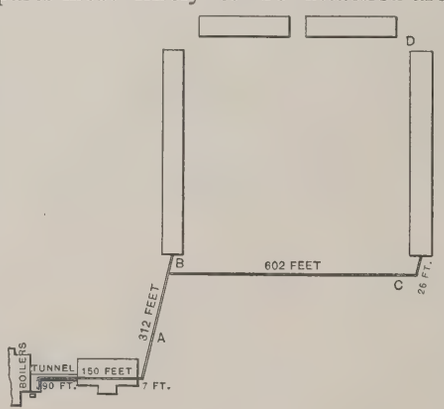


FIG. 3.

those where the circulation is bad, especially if such portions are also near the feed inlet.

The steam spaces are generally free from pitting, unless the boiler is frequently kept standing with water in it. As the water evaporates, pitting is then likely to occur along the region of the water line, a part which in a working boiler is generally free from attack. This is especially the case if longitudinal joints of the boiler are liable to be exposed by the evaporation of the water, and to form a ledge on which moisture can rest. When a boiler forms one of a battery, and is kept standing for a long interval, the top of the boiler is liable to pitting. Steam finds its way into it, and condenses on the roof, causing bad pitting there.

Perfectly pure water containing no air does no harm, and steam alone will not cause pitting, unless it gets a supply of air. The Loch Katrine water of Glasgow, which causes pitting on clean boilers, contains much gas. MM. Scheurer-Kestner and Meunier-Dolfus inclosed a polished iron bar in a natural water containing much oxy-

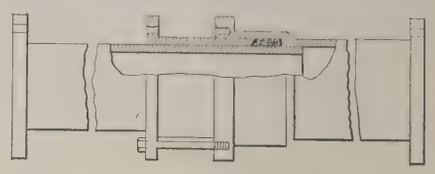


FIG. 4.

gen, and no lime salts. The bar gradually rusted, but the corrosion ceased when the oxygen was used up. The bar was then removed, repolished and put back, after which it remained perfectly bright. Repeating the experiment with water containing lime, the rusting was much less complete, the lime salts forming a protective layer on the iron, but on polishing this off corrosion recommenced. In distilled water the bar remained quite

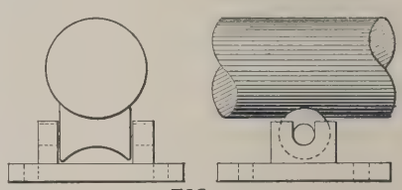


FIG. 5.

bright. The corrosion is much more rapid if the water contains carbon dioxide as well as oxygen. In this case a voltaic action takes place. The rust first formed is electro-positive to the iron, which then dissolves away, decomposing the water. It is for this reason that in cases of pitting it is essential that all traces of the iron peroxide should be cleaned from the metal, or the rusting will continue.

Cracks in boiler plates may be due to overheating or to unequal contraction and expansion, or to letting cold water strike on a hot plate, and this last often happens in hurrying to clean a boiler. As a general rule, it is safe to say that accidents from the overheating of boiler surfaces do not occur at the moment of overheating, but at some subsequent period.

From recent statistics on the world's coal fields, it appears that of the entire known coal area the United States has 58.7 per cent, and British America has 13.1 per cent, while England has but 2.8, and Spain, France, Germany and Belgium have together 1.9 per cent. The total production of coal in

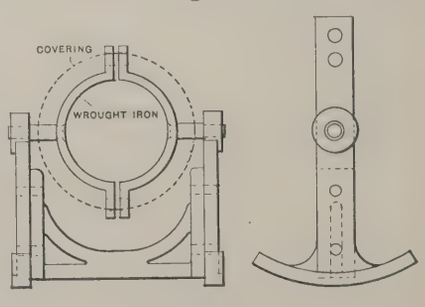


FIG. 6.

1891 is estimated to have been 520,000,000 tons, of which 150,000,000 tons were produced in the United States.

Hand-Hole Guards.

It sometimes happens that a boiler manufacturer who has paid great attention to the more important parts of his boilers, fails to give due consideration to the small things about them that occasionally give trouble. One of these "small things" is the hand hole guard; and as very little is said about this comparatively insignificant item in the books, we propose to offer a few words of advice about it in the present article.

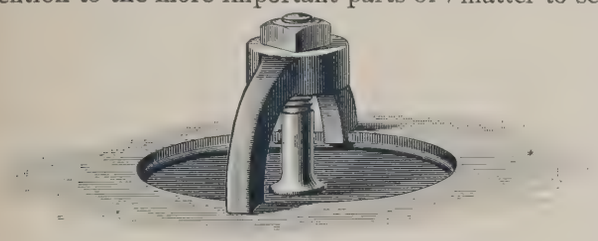


FIG. 1.—COMMON TWO-LEGGED GUARD.

The simplest form of guard that we know of is shown in Fig. 1; and this form, in our opinion, is also the best one for general use that has yet been proposed. It is often made unnecessarily heavy, but as this does not interfere with its efficiency, one could only object to the extra weight on æsthetical grounds; and it is hardly necessary to say that æsthetics and such mundane things as hand-hole guards have no business with each other, anyway. Moreover it is better to have the guards too heavy than too light, because they will then be less liable to injury from burning.

The only strain that comes on a hand-hole guard is that which is put upon it at the outset in screwing up the nut so as to make the gasket tight. The steam pressure, by compressing the gasket, tends to relieve the strain on the guard, rather than to increase it. So far as strength is concerned, therefore, the two-legged form of guard is quite satisfactory. In days when boilers were made with three-eighth inch iron heads, and gaskets were much harder than those now in use, it was found that when a two-legged guard was used, the head would sometimes spring enough to cause a slight leakage around those parts of the hand-hole that were furthest from the legs of the guard. A four-legged guard like that shown in Fig. 2 was therefore favored by many builders, and it was held that this form would prevent the plate from springing sensibly. If the four legs rested equally on the head there can be no doubt that this would be the case; but it is readily seen that it is no easy matter to secure this condition. If the head and the guard were carefully planed, or "surfaced," the bearing of the legs could be made practically perfect; but in actual practice we should find, in most cases, that two of the legs took all the strain, the others being of no particular use. Even if the guard were nicely fitted in one position, the chances are that the first time the fireman took it off he would turn it bottom side up, and then all the careful fitting would become useless. With steel heads, half an inch thick or thereabouts, and with reasonably small hand-holes, there should be no sensible springing of the head with the soft gaskets now in use; and this fact, combined with the extra difficulty of adjusting the hand-hole plate properly when four-legged guards are used, seems to indicate that in all ordinary cases the two-legged form is quite as good as the quadruped variety.

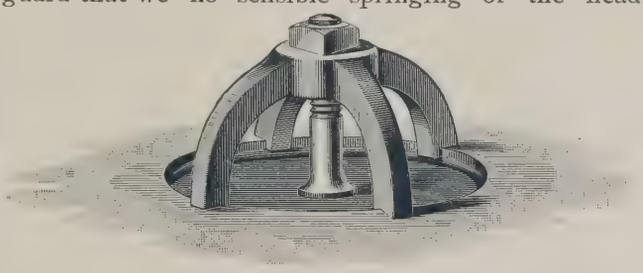


FIG. 2.—ILLUSTRATING THE FOUR-LEGGED FORM.

In Fig. 3 we show a "ring-guard," a form which is now used much less than formerly. This style of guard is particularly objectionable. If there is any leakage around the hand-holes, or any occasional dripping from the tubes overhead, or any condensation of corrosive substances distilled off from the fire, the ring-guard is sure to show at its worst. The moisture or condensible matter from the fire is drawn in between the ring and the head, by capillary attraction, and then the head begins to waste away under the ring, as shown in section in Fig. 4. After a time this destruction of the edges of the hand-hole proceeds so far that the hole has to be cut larger; and if another ring-guard is put on, the same action continues. The time required for the destruction of the edges of a hand hole in this way will naturally vary with the conditions; with a new boiler it may be three or four years.

The wasting does not necessarily take place uniformly in all directions; for if the hand-hole leaks a little, it will be found that the deterioration is most rapid along the lower part of the ring, where the escaped water collects. The hand-hole opening is usually cut as near the flange of the head as possible, for the double purpose of having it a sufficient distance from the tubes, and of having it as near the bottom of the boiler as practicable. It will be readily understood, therefore, that any further enlargement of the hand-hole along the lower side is apt to make trouble, because as soon as the hole reaches the flange it becomes impossible to make a tight joint without using some special form of plate or gasket; and special forms of plates and gaskets are objectionable, because the fireman, unless he is a pretty good man, is more or less apt to put them in wrongly, thus making matters even worse.

The engraver has shown the ring-guard (Fig. 3) as though there was considerable space between the ring and the arched rib through which the bolt passes. In practice this space is smaller than shown, and it is not an easy matter to put the hand-hole plate on properly when using a ring-guard, unless one knows the right way to do it. The easiest way, in our opinion, is this: Take a hitch about the bolt with a piece of string, and pass the string through the bolt-hole in the guard. Then put the plate into the boiler and bring it into its proper position. It can now be held by pulling on the string, and the guard can be slipped into position. The nut also can be passed over the string, or the string may be removed and the nut

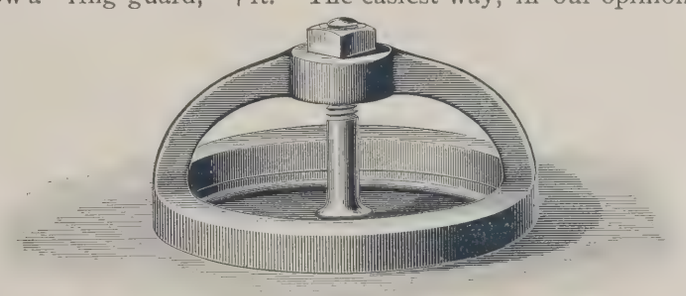


FIG. 3.—THE RING GUARD.

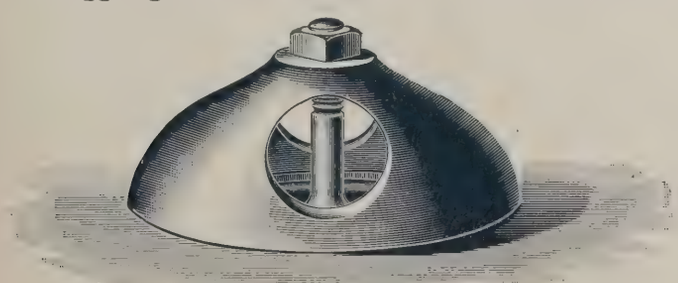


FIG. 5.—THE SCREW-GUARD.

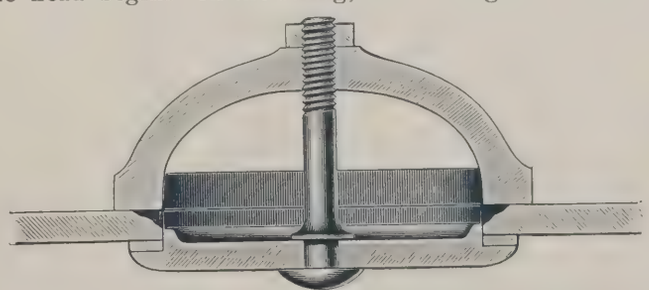


FIG. 4.—ILLUSTRATING THE EFFECTS OF RING-GUARDS.

screwed carefully on by hand as far as it will go, the job being finished with the wrench.

If the bolt projects too far beyond the guard it is apt to burn so that the nut cannot be removed, the bolt twisting off before the nut slips on the thread. A preliminary application of kerosene to the nut often greatly facilitates its removal; and it is a good plan, when putting the plate on, to first apply to both bolt and nut a paste made of machine oil and black lead. To protect the projecting end of the bolt it is well to screw on a second nut; it will not matter if this second nut only catches one or two threads, as it is not intended to hold anything, its only purpose being to protect the thread of the bolt from the direct action of the fire. Another plan for protecting the bolt, which is often tried with good results, is to first make quite sure the hand-hole plate is tight, and then to cover up the nut, bolt, guard, and all, with a double handful of fire-clay. This soon bakes on and forms an excellent protective covering. It is readily removed by light blows of the hammer; and as steam or water will disintegrate it, it does not conceal leakages, nor promote corrosion by keeping the head of the boiler damp.

In Fig. 5 we show the old-style "shell-guard," which was probably first designed with the idea of protecting the bolt somewhat from the fire. The protection secured by it is slight, however, and as the objections that we have urged against the ring-guard apply to this form with even greater force, we consider the "shell-guard" to be the least desirable of all the forms shown in the present article.—The Locomotive.

Measuring Moisture in Steam.

Though the following means of determining the moisture in steam, as given by The Paper Trade, will not give accurate results, it will serve the purpose where accuracy is not absolutely required.

To one part of salt boiler water there is added 100 parts of pure condensed water, and into this is poured a small quantity of concentrated solution of yellow chromate of potash. Then a nitrate of silver solution containing about 1-10 per cent of this salt is slowly added. With each drop the salt water turns locally orange red, but this color disappears at first; later on, when all the salt has been acted on, the whole fluid changes color from pale to yellow orange. The quantity of nitrate solution is noted, and the experiment is repeated on the condensed steam from the engine, undiluted with distilled water. The ratio of the quantities of nitrate of silver solution used in the two tests, expresses the amount of priming in per cent.

The new rules of the supervising inspectors require that iron shall be tested and passed upon at the works before being shipped.

Relation of Air Volume to Temperature.

Walter B. Snow

Wherever the blower system is employed without the refinement of the hot and cold duct arrangement, or supplementary coils, the air supply to various rooms must be proportioned according to their exposure and the mean temperature desired. As a rule, under such conditions, the volume thus supplied is commonly expressed by the time required to effect a change of the entire contents of the room, not in feet but in capacity, and thus a 15-minute or a 20-minute change clearly indicates the relative volume supplied.

With the present existing methods of determining the conductive power of various building constructions the total loss of heat by passage through walls and windows can be ascertained with reasonable accuracy. This loss, when there is absolutely no change of air within the building, represents the total cost of heating. But such a condition is practically impossible; even with direct steam there is constantly leaking directly through the walls, or escaping through cracks or crevices, a very considerable amount of air.

With the blower system this volume becomes definite in quantity and positive in supply. Under the conditions of ordinary heating by this system, in a building of several rooms, there will be no return of air from the building to the apparatus, and consequently all air forced into the various apartments must escape from them, and substantially at the average temperature within them. This loss, measuring in fact the cost of ventilation, is entirely distinct from that previously mentioned, which is, on the other hand, indicative of the cost of heating.

It is thus evident that both of these losses are determinable under stated conditions, and that once known they serve to determine the volume and temperature of the air necessary to be supplied for the purpose of maintaining a given temperature. Of course, the higher the temperature to be maintained the higher must be that of the air admitted, or else the larger must be the volume supplied if a change in the temperature is impossible. This latter is the case under consideration, and as some convenient method of calculation of relative requirements is desirable, one is here presented that merely simplifies the formulae necessary and gives the results in the form of a series of curves.

The method and the principle can best be made clear by a detailed explanation. Let us therefore assume an ordinary factory building divided into several rooms and heated by the blower system, the entire air supply for the apartments being taken from out of doors. Further, let us accept what may be considered ordinary maximum conditions, viz., zero outside, 70 degrees to be maintained within, and a volume of air equivalent to the contents of the building supplied in fifteen minutes, at a temperature of 130 degrees.

Then, by the method of explanation employed in a former article, there will be lost in any given time $\frac{70}{130}$ of the heat by mere leakage of air from the building at a temperature of 70 degrees and $\frac{60}{130}$ by the natural passage of heat through the walls and windows in accordance with the laws of transmission due to difference in temperature upon the two sides.

Suppose that without change in the volume of air admitted, it is desired to heat some given room to 80 degrees instead of 70 degrees, then the direct transmission loss will be increased in the proportion of $\frac{80}{70}$ (80 being the difference between indoor and outdoor temperatures), while the leakage loss will also be $\frac{80}{70}$ of that previously existing, and if the temperature of the admitted air could be increased it would require to be.

$$130\left(\frac{80}{70}\times\frac{70}{130}+\frac{80}{70}\times\frac{60}{130}\right) \text{ or } 130\left(\frac{80}{130}+\frac{68.6}{130}\right)$$

or 148.6 degrees.

But, under the conditions, the temperature of the entering air cannot be made greater and therefore an increase in the heat units supplied can only be secured by decreasing the time to change the air, that is, by increasing the volume per unit of time, and we must note that any increase in volume to compensate for transmission losses entails increased leakage of air, which is obviously at the higher temperature—here at 80 degrees. Hence, whereas in the first instance, proportionally, the leakage loss was 70 parts and the transmission loss $130 - 70 = 60$ parts, the leakage will now be represented by 80 parts and the transmission by $130 - 80 = 50$ parts, each for a given unit of time, the entering air still maintaining a temperature of 130 degrees.

If, now, with a difference of 70 degrees between the inside and outside temperatures, a loss of 60 parts by transmission occurs in 15 minutes, or $\frac{60}{15}$ or 4 parts per minute, then for a difference of 80 degrees the loss will be increased to $\frac{80}{70}\times\frac{60}{15} = 4.57$ parts per minute. But in the second instance (indoor temperature at 80 degrees), the total loss by transmission is 50 parts, and as the constant loss by this means has just been shown to be at the rate of 4.57 parts per minute, the entire 50 parts will be lost in $\frac{50}{4.57} = 10.94$ minutes, or, in short, in $\frac{70}{80}\times\frac{50}{60}\times 15 = 10.94$ minutes. That is, to maintain a temperature of 80 degrees in a given room under the above given conditions, a change

of air is required every 10.94 minutes, and $\frac{15}{10.94} = 1.37$ as much air must be supplied to maintain a temperature of 80 degrees as is required to maintain 70 degrees under the same existing conditions of outside temperature and entering air.

The entire operation may be expressed thus

$$15 \div \left[50 \div \left(\frac{60}{15} \times \frac{80}{70}\right)\right] = 1.37.$$

This calculation has been carried through on an assumed air change of 15 minutes. Although it may seem strange, nevertheless the time of change makes no difference in the resulting factor. This may be shown if, instead of employing 15, we express by x in the formula the time required to change the air. The formula then becomes

$$x \div \left[50 \div \left(\frac{60}{x} \times \frac{80}{70}\right)\right] =$$

$$x \div \left[50 \div \left(\frac{4,800}{70\,x}\right)\right] =$$

$$x \div \left[50 \div \left(\frac{68.6}{x}\right)\right] =$$

$$x \div \frac{50\,x}{68.6} = \frac{68.6\,x}{50\,x} = 1.37$$

for both x's cancel out, showing that any value may be used for x without affecting the result.

If the contents of the various rooms have been tabulated, this factor can be most readily applied by simply multiplying by it the contents of such rooms as are to be heated to 80 degrees, and then proportioning pipe and flue area relatively to these corrected contents.

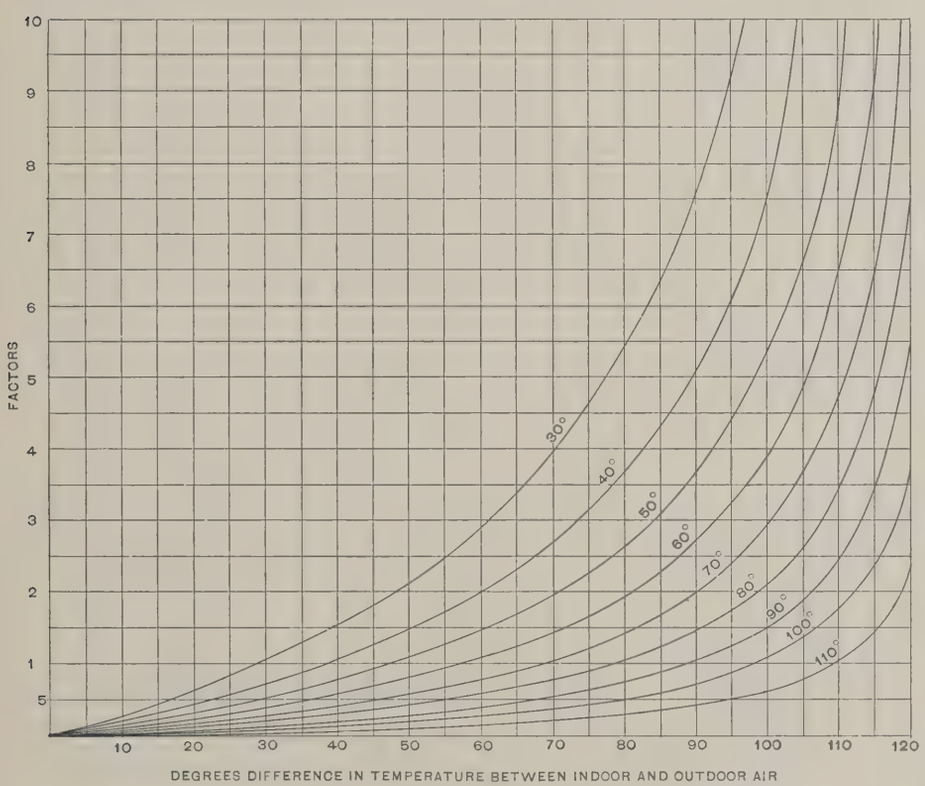
The results of a series of calculations by this method—on the basis of a given volume of air at 130 degrees being capable of heating the given building to various temperatures from 30 to 110 degrees—are represented by the accompanying curves, from which may be read the factor to be employed for any given difference in temperature between indoor and outdoor air, each line representing factors for any basis temperature at which the given volume at 130 degrees will maintain the building, the factor 1 applying when the temperature of 30 degrees is to be maintained. Of course the factors hold only under the above conditions, but similar sets of curves may be developed by the same method for other temperatures of entering air. As the curves are worked out for differences in temperature it must be evident that to obtain, for instance, the factors for a temperature of 20 degrees below zero outside, and 70 degrees inside the curve for the total difference, viz., 90 degrees, must be used.

Under the following illustrative conditions of contents and desired temperatures, the factors would be applied to make the apparent relation of contents as shown.

Capacity of Room.	Desired Temperature.	Factor.	Relative Capacity.
75,000	70°	1	75,000
40,000	80°	1.37	54,800
80,000	90°	1.93	154,400
35,000	40°	.38	13,335
100,000	65°	.86	85,700
330,000			383,235

Hence, if it is understood that a given air change will heat the entire structure to 70 degrees, it will require an increase to $\frac{383,235}{330,000}$ or 1.16 times the aggregate air volume to accomplish the desired results. The vast difference between requirements at high and low temperature is evident in the factors for 40 and 90 degrees, the latter being more than five times the former. If carried to its limits this method of calculation will show no air change to be required at zero degrees, and an infinite change to maintain the same temperature as that of the entering air.

Of course, corrections for exposure and material of construction must be applied wherever possible, but for approximate work this represents a simple method which can, of course, be refined by separately estimating the transmission and leakage losses, and therefrom calculating the exact amount of heat required for each room. The curves here presented are intended, however, to cover average conditions, subject to individual corrections for various rooms, and as such indicate the relative air volumes required under equivalent conditions of exposure and construction.



Steam Pipe Covering.

BY LOUIS SCHMIDT.

I have experimented with the different steam pipe coverings sold in the market with respect to their non-conductivity, strength, durability, etc., in the following manner:

I had constructed an apparatus with six 2-inch steam pipes 6 feet long extending from it. It was arranged with a trap, so that dry steam went into these pipes. At the end of each 6-foot length was a cap and a ¼-inch nipple and valve, by which the condensation was drawn off. Upon the four inside lines was placed 6 feet of the different sectional coverings to be tested. All connections were thoroughly covered. The outside lines were covered (5 and 6) so as to place all of the sectional coverings under equal conditions. The samples were numbered from 1 to 6 inclusive, the composition, the first four being given in the table below. No. 5 was an asbestos cement, and No. 6 a plastic form of magnesia. I purchased all of the coverings on the open market from the agents of the manufacturers.

Steam was turned on at midnight; the valves at the end of each 6 feet of the coverings were opened to allow the condensation to drip into buckets; at 7 o'clock in the morning the valves were closed, and the condensation was drawn off each hour until the pipes became thoroughly heated and the quantities of water became uniform. At 12 o'clock noon the test was started; the condensation was drawn off and measured for three consecutive hours, namely, 1, 2 and 3 o'clock, with the following results;

No. 1,	231	grams,	or 38½ gr.	pr. ft.	pr. hr.
No. 2,	228	"	or 38 "	"	"
No. 3,	272	"	or 45⅓ "	"	"
No. 4,	226	"	or 36 "	"	"
No. 5,	392	"	or 65⅓ "	"	"
No. 6,	232	"	or 38⅔ "	"	"

Average steam pressure, 73 pounds; temperature, 315 degrees F.; average temperature of room, 28 degrees C. or 82.4 degrees F. Tests were then made of the strength of each of the sectional coverings in the following manner: Cross sections of pieces for 2-inch steam pipe one inch high were subjected to pressure until crushed to one-half inch in height in each case, with the following results:

	Area.	Ultimate stress.		Pressure.
No. 1,	11 sq. in.	660 lbs.	60 lbs.	per sq. in.
No. 2,	11 "	1230	113 "	" "
No. 3,	11 "	1175	107 "	" "
No. 4,	11 "	2800	255 "	" "

Pieces carefully cut from the sections

used in the test were subjected to pressure in the same manner, with the following results:

Area.	Ultimate stress	Pressure.
No. 1, 11 sq. in.	460 lbs.	42 lbs. per sq. in.
No. 2, 11 "	480	43.5 " " "
No. 3, 11 "	360	32.7 " " "
No. 4, 11 "	2800	255.0 " " "

The coverings were only on the steam pipes 15 hours. No. 4 stood the same pressure after as before.

Pieces of each were soaked in water for three weeks.

No. 1 softened and disintegrated.

No. 2 disintegrated completely.

No. 3 less rigid than No. 1, more rigid than No. 2.

No. 4 remained rigid.

A sample of each covering was then taken from the pipe and an analysis made thereof, yielding the following results:

	No. 1. per cent	No. 2. per cent	No. 3. per cent	No 4. per cent
Moisture	8.28	4.58	7.36	2.98
Asbestos	4.73	3.24	5.47	4.78
Alumina and iron	0.62	1.21	5.75	2.65
Sulphate of lime	86 37	90.97	81.42	None
Magnesia	trace	trace	trace	89.59

This report was made for the purpose of finding out the true relation which each covering bears to the others in non-conducting qualities, strength, etc. Having purchased all of the coverings in person in the open market, insured representative samples of the material as sold by the manufacturers.

The coverings above mentioned were applied in my presence, in this way insuring an impartial test of all coverings under like conditions.

Under the head of medical and sanitary notes a recent issue of the New York Tribune contained the following on heating and ventilating school-houses: The plan of ventilating school-houses in Massachusetts possesses, it is asserted, possibilities of insuring first-class results, even when, from certain unavoidable obstacles, only one inlet is provided, being located about eight feet above the floor, and as nearly as practicable in the center of the warm or inner side of the room. Of equal importance with the inlets is the size of the outlets, or foul-air ducts, as well as their location, and it is found that, for a fifty-foot school-room, the outlet duct should have an area of not less than five square feet net; this is to be placed at the bottom of the inner side of the room or in the floor at the inner side, in case the air is to be taken from the first story down to the bottom of the foul-air shaft in the basement. The rule is, that in a room with two cold or exposed sides, the outlet should be as near the inner or warm angle of the room as possible, and, in a room with three exposed sides, the outlet should be as near the inner or warm side as practicable, this applying equally well whether the warm air is brought in through either one or two inlets. It is desirable that the outflow of air from the room through the outlet should be a little in excess of the amount brought in at the warm-air inlet, the difference being made up by air drawn into the room through cracks, etc.

Caleb Clark Walworth.

Caleb Clark Walworth, president of the Walworth Manufacturing Co., died on Thursday morning, November 22, at his home on Francis street, Longwood, Boston, Mass. Mr. Walworth was born in Canaan, N. H., March 23, 1815. He received what was considered in that day a liberal education, and for a short time taught school in his native town. For several years thereafter he lived in the West, where he accumulated considerable money by judicious investments in real estate, after which he came East again and connected himself with a firm, of which his brother, J. J. Walworth, was president, the concern being known as J. J. Walworth & Co., from which many of the leading engineers and steam fitters of this country have emanated.

Ably seconded in his efforts by the late E. C. Hammer, who eventually became its treasurer, the formation of the Walworth Manufacturing Co. was accomplished through the tireless energy of Mr. C. C. Walworth, whose master mind guided the company to its present phenomenal position as one of the most prominent and successful houses in the heating trade.

His numerous inventions, notably the multiple tapping machine, collapsing tap, die plate, manifold pipe vice, and an automatic machine for cutting and threading pipe, as well as his improvements in steam traps, wrought iron radiators, Stillson wrenches, and automatic sprinklers, placed the company in a strong position to compete with other manufacturers in its line. His constructive ability was of constant and incalculable value to the corporation, and his inventions were the basis of the Malleable Iron Fittings Co., of Branford, Conn., in which for many years he was a director.

He revolutionized the industry of tapping fittings by the invention of special machinery, and was the first to make valves and fittings to a scale, a method which has ever since been in universal use throughout the country. He had a rare faculty for almost instantaneously grasping the details and possibilities of any meritorious invention.

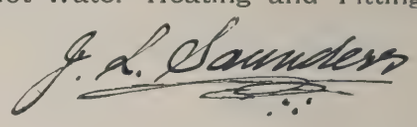
In 1881 the factory in Cambridge was found to be inadequate for the requirements of the business, and the Crystal Glass Works, at South Boston, were purchased, and a thoroughly equipped factory established by Mr. Walworth.

Aside from his inventive genius and business sagacity, Mr. Walworth was a born organizer, and for forty years his influence with the men, individually and collectively, was evinced by the fact that during various periods of discontent among the laboring classes, no strike ever occurred in his works, pending troubles having always been averted by his warm-hearted, judicious intercourse with all classes of his employees.

He was ever ready to appreciate merit among those who worked for the company, and constantly incited the young men to use their brains in perfecting labor devices.

His friends will remember him longest for his free-hearted generosity, his warm, ever-ready sympathy, willing assistance, and unselfish counsel. Those who knew him best valued him most, and will never cease to miss his genial personality.

Hot-Water Heating and Fitting.



Q. 15—Why does hot water cost less to run than other systems?

A.—For the reason that during the greater part of the time that artificial heat is required the weather is never very cold, and the quantity of coal consumed to keep the water circulating at about 80 to 100 degrees, which is usually hot enough, would not generate steam in a steam boiler, and would cause next to no results in a furnace. In very cold weather, with a system that is properly put in, the difference in the temperature between the water of the flow and return pipe is but a very few degrees; therefore it does not take much fire to raise the return water to the required temperature to keep the building comfortably warmed all the time. Again, as in a water system, the same water is used over and over again, there is no sudden inlet of very cold water, which would mean a sudden drop of temperature in the system and a larger consumption of fuel to raise it to the necessary temperature again. In a water system you always use a banked fire and not a surface fire, and there is always less consumption of fuel in a banked fire.

Q. 16—What is the best kind of hot water heater?

A.—There are many kinds of heaters on the market, and no doubt they will all do their work in a way. The best heater is that which is simple and mechanical in construction, and is so built as to favor the natural movement of the water as it becomes heated, and at the same time utilize as much as possible of the heat of the gases from the fire. It should have joints that can easily be made and kept tight, metal to metal, and that are away from the action of fire and gases, where they can be seen and got at easily if necessary. It should be easily cleaned and taken care of, and easily repaired, if repairs should at any time be required. It should be easily set up, and cased in with some material, such as asbestos or brick, thus preventing the radiation of heat into the cellar where it is not required. The grate, fire surface, and rating should be properly proportioned.

Q. 17—Which is the best class of heater, cast iron or wrought iron?

A.—There are many differences of opinion on this subject, but as far as

the writer is concerned he prefers cast iron, as it is less liable to external rust during the time that the heater is not in use, and by its use heaters can be constructed in more suitable forms. As a rule a cast iron heater has fewer joints to cause leaks, and is more easily repaired if repairs are required. Cast iron is a better conductor of heat, and if proper care is taken in the construction of the heater, to allow for expansion and contraction, there are but few chances of the heater's cracking.

Q. 18—In starting out to figure a hot water job what is the first thing necessary to do?

A.—Find out what kind of a building you have to heat, whether it is of stone, brick or frame construction, or partly frame, and partly stone or brick, whether it is well or poorly constructed, how it stands as regards exposure and points of the compass, what the building is used for, viz.: Residence, office, store, school, etc. Then figure out the amount of radiation required to thoroughly heat each and every room of the building. Having found the amount of radiation, then get the proper size boiler, valves, etc., and make estimated cost.

Q. 19—What is the correct way to calculate the necessary amount of radiation for each room?

A.—It should be calculated with reference to the capacity or cubic contents, square feet of exposed glass and exposed wall surface, and exposure to the points of the compass.

Q. 20—How do you obtain the capacity, exposed glass, and exposed wall surface?

A.—The capacity is obtained by multiplying the width, length, and height of the room together. The square feet of exposed glass surface is obtained by multiplying together the width and height of the several windows in the room, an external door being calculated as a window. The square feet of exposed wall surface is obtained by multiplying the length of the outside walls of the room by the height of the room, deducting from the product the number of square feet of exposed glass surface, so as to get the net amount of exposed wall surface. As an example we will find the capacity, exposed glass surface, and exposed wall surface of the room shown by the accompanying cut, the dimensions being marked on the cut:

Capacity $= 10 \times 12 \times 20 + (2.5 \times 8 \times 10) = 2,600$ cu. ft.

Exposed glass surface $= 4\,(3 \times 6) + 2\,(1.5 \times 6) =$ 90 sq. ft.

Exposed wall surface $= \{(10 \times 12) + (6 \times 10) + (2.5 \times 10) + (8 \times 10) + (2.5 \times 10) + (6 \times 10)\} - 90 =$ 280 sq. ft.

Q. 21—Having obtained the capacity, exposed glass, and exposed wall surface, how does one obtain the amount of radiation required?

A.—It is almost impossible to give a rigid formula of calculation, as the required amount of radiation varies according to the climate and the part of the country the building is in. But with the following basis and a little common sense, one cannot go far wrong. For parlors, sitting rooms, and the general living rooms of a residence, first floor, allow one square foot of radiation to every 35 to 50 cubic feet of space; one square foot of radiation to every 3 square feet of exposed glass surface, and one square foot of radiation to every 30 square feet of exposed wall surface. Taking the previous room, for example, we have with:

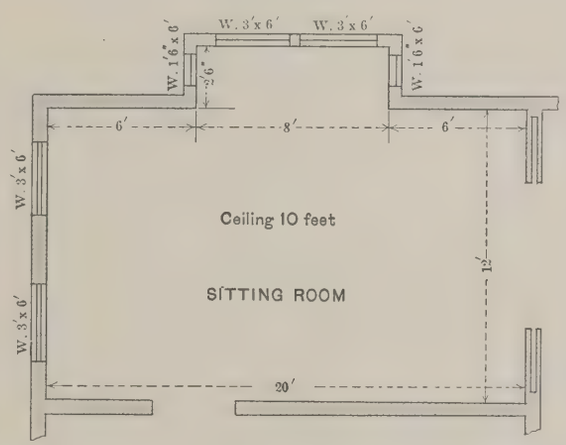
1 sq. ft. of radiation to 40 cubic feet of space $\frac{2,600}{40} = 65$ sq. ft.

1 sq. ft. of radiation to 3 sq. ft. of glass surface $\frac{90}{3} = 30$ sq. ft.

1 sq. ft. of radiation to 30 sq. ft. of wall surface $\frac{280}{30} = 9\frac{1}{3}$ sq. ft.

$104\frac{1}{3}$ " "

Thus we find that for a room of the above size and exposure in a fairly cold climate and an ordinary exposed position it would require $104\frac{1}{3}$ square feet of radiation to heat it to 70 degrees Fahrenheit in zero weather.



For libraries and dining-rooms, first floor, allow:

1 sq. ft. radiation to every 30 to 45 cubic feet.
1 " " " " " " 3 sq. ft. glass surface.
1 " " " " " " 30 " " wall "

Reception halls, first floor, allow:

1 sq. ft. of radiation to every 40 to 50 cubic feet.
1 " " " " " " 3 sq ft glass surface.
1 " " " " " " 30 " " wall "

Ordinary stair halls, first floor, allow:

1 sq. ft. radiation to every 40 to 55 cudic feet.
1 " " " " " " 3 sq. ft. glass surface.
1 " " " " " " 30 " " wall "

Chambers on second or third floor, or in fact most any chamber above first floor, allow:

1 sq. ft. radiation to every 50 to 65 cubic feet.
1 " " " " " " 3 sq. ft. glass surface.
1 " " " " " " 30 " " wall "

For libraries, sewing rooms, or nurseries on floors above first floor, and which require to be warmer than the chambers, unless it be a room that is to be used as a sick chamber, allow:

1 sq. ft. of radiation to every 45 to 55 cubic feet.
1 " " " " " " 3 sq. ft. glass surface.
1 " " " " " " 30 " " wall "

Bath rooms, allow:

1 sq. ft. of radiation to every 30 to 40 cubic feet.
1 " " " " " " 3 sq. ft. glass surface.
1 " " " " " " 30 " " wall "

The above is for heating chambers to 65 degrees F., library, nurseries and sewing rooms to 70 degrees F., and bath rooms to 75 degrees F. in zero weather.

Public school rooms:

1 sq. ft. of radiation to every 60 to 85 cubuic feet.
1 " " " " " " 3 sq. ft. glass surface.
1 " " " " " " 30 " " wall "

Offices:

1 sq. ft. of radiation to every 50 to 65 cubic feet.
1 " " " " " " 3 sq. ft. glass surface.
1 " " " " " " 30 " " wall "

Factories and stores:

1 sq. ft. of radiation to every 65 to 90 cubic feet.
1 " " " " " " 3 sq. ft. glass surface.
1 " " " " " " 30 " " wall "

Assembly hall and churches:

1 sq. ft. of radiation to every 90 to 150 cubic feet.
1 " " " " " " 3 sq. ft. glass surface.
1 " " " " " " 30 " " wall "

Q. 22—What is the correct way to find the necessary amount of indirect radiation required to heat a room?

A.—First find the required amount of direct radiation according to the foregoing method, and add 50 per cent extra; that will give the amount of indirect radiation. This is true if wrought iron pipe coil surface is used; if cast iron pin indirect stack surface is used it is advisable to use from 70 to 80 per cent extra. Taking the room which we have found requires $104\frac{1}{3}$ square feet of direct radiation, to heat it by direct radiation would require $104\frac{1}{3} + (104\frac{1}{3} \times .50) = 156\frac{1}{2}$ square feet of indirect wrought iron coil surface.

Q. 23—What is the correct way to find the proper sizes for hot air flues, cold air ducts, and registers for indirect work?

A.—Hot air flues, first floor: Make the net internal area of the flue equal to $\frac{3}{4}$ of a square inch to every square foot of radiating surface in the indirect stack. Hot air flues, second floor: Make the net internal area of the flue equal to $\frac{5}{8}$ of a square inch to every square foot of radiating surface in the indirect stack. Examples: First floor, a room requiring $156\frac{1}{2}$ square feet of indirect radiation would necessitate a hot air flue $(156.5 \times .75) = 117.375$ square inches in area, or a flue, say, 12 by 10 inches; second floor, for a room requiring the same amount of radiation, we have $(156.5 \times .625) = 97.8$ square inches area, or a flue, say, 8 by 12 inches.

Cold air ducts, first floor: Make the net internal area of the duct equal to $\frac{5}{8}$ of a square inch to every square foot of radiating surface in the indirect stack. Example: In a room requiring $156\frac{1}{2}$ square feet of indirect radiation the cold air duct would be $(156.5 \times .625) = 97.8$ spuare inches area, or a duct, say, 8 by 12 inches. Cold air duct, second floor: Make the net internal area of the duct equal to $\frac{1}{2}$ of a square inch to every square foot of radiating surface in the indirect stack. Example: In a room requiring $156\frac{1}{2}$ square feet of indirect radiation the cold air duct would be $(156.8 + .5) = 78.25$ square inches area, or a duct, say, 7 by 11 inches.

Hot air registers should have their net area equal in full to the area of the hot air flues. Multiply the length by the width of the register in inches; $\frac{2}{3}$ of the product is the net area of register.

(To be continued.)

Steam Fitters' Guide.

Q. 129—What is the Williames vacuum system of steam heating?

A.—It is a system of exhaust heating by means of which the usual back pressure, due to loading the exhaust for the purpose of creating a forced circulation in the coils or radiators, is done away with by creating a suction at the tail end of the system so as to draw the steam through the apparatus, thereby performing the double function of heating the building without back pressure to the engine, and reducing the normal pressure by creating a partial vacuum in the exhaust pipe.

Q. 130—Is the system adapted for use in heating buildings where there is no exhaust steam to be utilized?

A.—Yes. Where there is no steam engine live steam is passed directly into the piping, and by creating a suction in the bleeder-main the building can be thoroughly heated in little time.

Q. 131—Of what does the system consist?

A.—In an arrangement of apparatus for drawing the steam and condensation through the piping by suction instead of forcing the circulation by pressure. The accompanying cut gives a good general idea of way in which the system is arranged. It will be noticed that the main feature of the apparatus required is simply an attachment (usually a pump) whereby a partial vacuum is maintained in the piping, thus insuring perfect circulation through the heating system.

Q. 132—Is the system designed for high or low pressure work?

A.—Both. In some cases better results in effective heating have been obtained with this method under a low initial boiler pressure than were obtained before its installation with a high initial boiler pressure.

Q. 133—What advantages has the system?

A.—Besides the saving which is generally effected by its introduction, the efficiency of the engine (if engine is used) and the boiler capacity are increased, and immediate circulation and absence of noise and freezing in pipes, are among its other advantages.

Q. 134—Can this system be put in without changing the old piping?

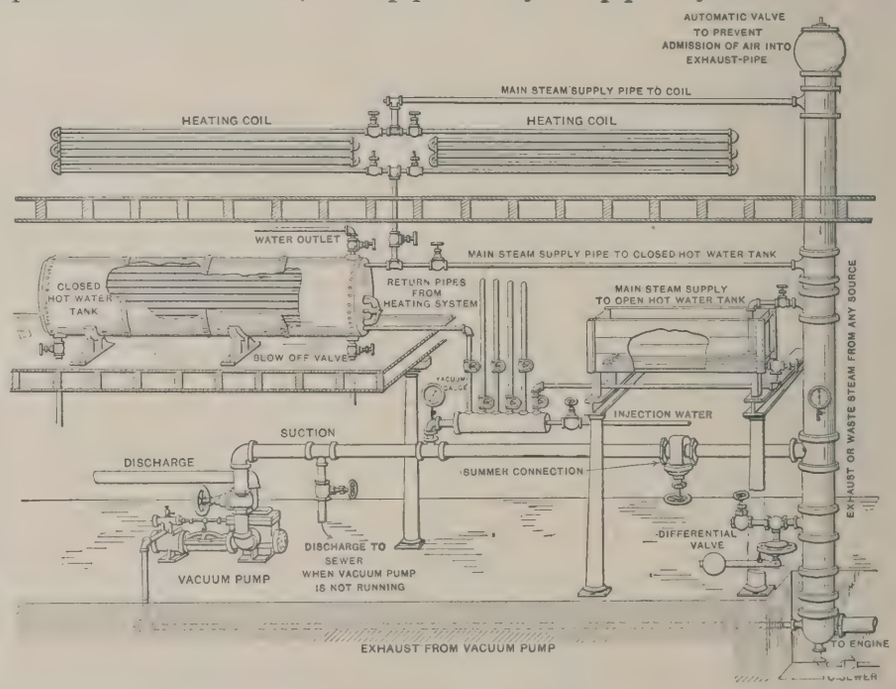
A.—No very material change in existing piping is necessary, the oldest and most defective being rendered practically as efficient as more modern installations, and the system can be so arranged that the existing methods of heating can be restored immediately if desired. It will be readily understood that the increased efficiency is due to the fact that the air is not forced out by pressure, and that the condensed water does not have to find its way by gravity to the return end of the heating system.

Q. 135—What are some of the points necessary to be observed in installing this system?

A.—Coils such as are shown by the illustration, are preferably constructed with return bends, the pipes being level, 1 inch in diameter, and not over 500 feet in length for each coil, supported with hook plates not over 10 feet apart. Coils may be horizontal or vertical, according to the structural requirements of the apartments to be heated. The main steam supply pipe should not be less in area than the combined area of the inlets to the coils. Inlets of coils should be of the same diameter as the pipes of which they are made. The bleed or waste end of the coils should not be less than ½ the diameter or ¼ the area of the inlet. The coils may be constructed any number of pipes high, but it will be found most convenient to use an even number of rows of pipes in order that the inlet and outlet will both be at the same end of the coil.

The bleeder main from coils, returning the condensation to the pump, should not be less in size than the combined areas of the bleed or waste pipes connected into it; the pipe this way, with this amount of heating surface, will be found to give most satisfactory results. Compared with the overhead or hanging coils from the ceiling, the system described requires at least ⅓ more pipe, or eight rows around the apartment, to do the same heating, but it is claimed never produces as uniform heat, or as satisfactory results as when used on side walls, etc. Five hundred feet of 1-inch pipe is about the limit in practice, made up into one or more coils, using steam at atmospheric pressure, maintaining 10 inches of vacuum in the bleeder main at the pump or receiver, and will be found to condense, in ordinary cold weather, the steam from one indicated horse power of an automatic cut-off engine, using 33 pounds of steam per horse power per hour. For illustration: An engine indicating 50 horse-power would supply sufficient exhaust steam to circulate and heat 25,000 feet of 1-inch pipe, made up into coils and mains, as before described.

Any size pipe may be used in coils



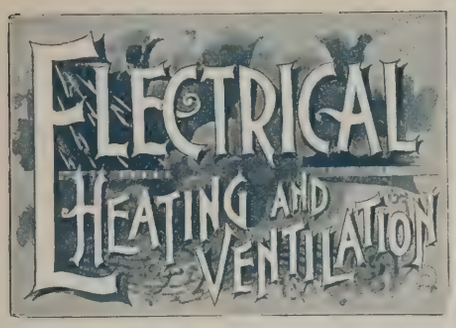
should be increased as coils are connected, and each coil should be constructed with two valves, namely, inlet and drip or outlet valves. These valves should be of the same size as the inlet and outlet on coils, using on inlet a valve having a wheel allowing adjustment, and on the drip or bleed a valve of the key pattern, admitting of stationery adjustment for necessary requirements.

A differential valve should be provided, as shown, for supplementing live steam at night, etc., when no exhaust is available.

In piping a building on the north and northwest exposure, use ⅓ more heating surface than on the south or southeast exposure. For illustration: Building 60 by 200 feet, 10-foot ceiling, coils placed 3 inches from the wall, 8 inches from the floor, and under windows, use six pipes high on the north and northwest exposure, and four pipes high on the south and southeast exposure. Coils erected in for instance, 1¼, 1½, or 2 inches, but none of these sizes will be found to be so cheap and convenient in erecting as 1-inch. Coils of 1¼-inch pipe may be 800 feet in length; 1½-inch 1,000 feet in length, and 2-inch, 2,000 feet.

In running the exhaust supply to the coils, the best plan consists in heating from the top downward to the respective floors, that is, branching from the exhaust at the top of the building, using an opening equal to the combined area of all the coil supplies intended to be used throughout the building, placing a stop valve at this connection, for shutting off the system in the summer. This main can be branched from with drop lines, reduced from floor, as taken off.

The word "zero" is from the Spanish, and means empty, hence nothing. It was first used for a thermometer in 1795 by a Prussian merchant named Fahrenheit.



Electric Temperature Regulation.

Recognition of the positive unreliability of the personal factor in heat regulation, and, at the same time, of the absolute necessity of a uniform temperature in our offices and homes in order to maintain health and to prevent, as far as possible, the evil effects of sudden variations in climatic conditions, has lead to the perfection of automatic devices by which a uniform regulation of temperature is secured, without personal attention.

People are very apt to overheat their homes with the result that they became over-sensitive, so that when they go out of doors the sudden change of temperature makes them take cold, the complete recovery from which is not by any means certain. It is undoubtedly true that much sickness would be avoided by the maintenance of an even temperature under all conditions, and in the attainment of this object electricity seems to have found one of its most useful and valuable applications.

The system of heat regulation, of which the following is a description, known as the Compton automatic and electric service system, is the invention of Melvin B. Compton, and represents years of patient and costly tests and experiments.

The thermostat, shown by Fig. 1, consists of a blade or bar composed of two different metals, about 8 inches long, 1 inch wide, and of the thickness of an ordinary knife blade, and is suspended in a rigid position between two magnets. These are adjusted by a pointer which can be set, in accordance with a scale upon the thermostat base, to close electric circuits automatically at any degree of heat it is desired to maintain the temperature.



FIG. 1.

The thermostat is placed upon the wall of the apartment or one of the rooms wherein it is desired to have the temperature regulated, and a small cable of three wires connects it to an electric motor, which is located in a convenient position in the cellar, to open and close the draft of the heating apparatus, as indicated by Fig. 3.

The motor may also be placed in position at a radiator, as shown by Fig. 2, to operate the supply valve automatically if the apartment be heated by steam or hot water, or connected with the heat pipe leading to the register, so that the different rooms may be maintained at different or the same temperatures as desired. This is accomplished by the rise and fall of the temperature affecting the thermostatic bar, which automatically closes the electric circuit leading to the motor, which, in its turn, causes the heat to be checked or increased, as the case may be.

Four cells of ordinary open-circuit battery, such as are used for ringing door bells and the like, supplies all the necessary power. All the attention required is the renewal of the solution and the zinc in these batteries once a year, the cost of which will not exceed 50 cents. The system requires no attention, and is perfectly automatic in its operation.

The moment the temperature rises

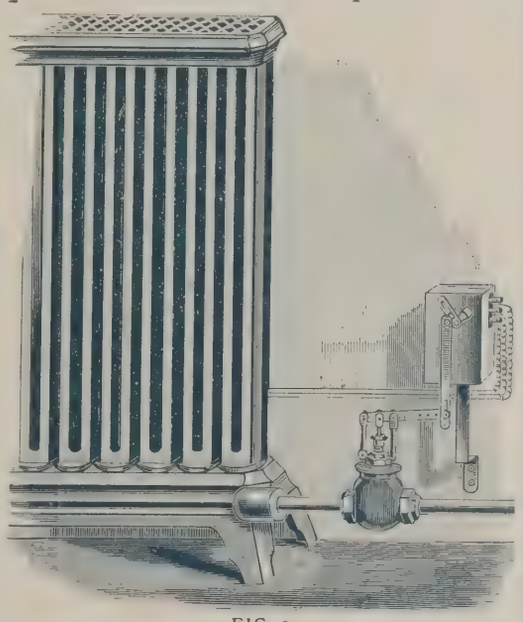


FIG. 2.

one degree above the point at which the thermostat is set, one of the circuits is automatically closed by the expansion of the thermostatic bar, causing the electric motor to be operated, which, in its revolution, checks the draft of the heating apparatus if attached as in Fig. 3, or closes a valve if it be connected with a radiator, as in Fig. 2, in either case checking the heat.

The moment the temperature falls again and reaches one degree below the point at which the indicator on the thermostat is set, the other circuit is automatically closed by the contraction of the thermostatic bar, when the valve connected with the radiator is again opened, or the draft on the heating apparatus is again increased, which, in either case, will cause the temperature to again rise. The thermostat thus operates the motor so as to maintain any temperature desired, whether it be zero or 500 degrees, within two or three degrees variation from the point at which the indicator is set, without any personal attention.

This work is performed more perfectly than it would be possible to have it accomplished even though a person were to sit in front of a thermometer with two push buttons at his side connected by electric circuits with a motor, pressing one the moment the temperature became too great, thus checking the heat, and pressing the other one the moment the thermometer indicated a fall of temperature a single degree, and by this means increasing the heat again.

By the use of a specially constructed annunciator in connection with the thermostats, changes in temperature are instantly made known. Where the system is used in factories, an annunciator placed in the engine room indicates to the engineer the temperature in the various rooms equipped with thermostats.

The opening and closing of valves of any size can be automatically effected by the use of the valve controller, which is an integral part of this system, and the valves may be located at any point distant from the thermostat or circuit closer. In a factory the engine may be automatically stopped from any part of the building or plant, in case of accident, without the intervention of the engineer, and the engine may likewise be started.

Among other valuable applications of the electric valve controller may be mentioned its use in connection with fire extinguishing apparatus in buildings, opening and closing of reservoir valves, and the maintenance of steam pressure at a given point. In case of fire the valve in a standpipe can be instantly opened without waste of time in going to the basement where the value is located The Compton Electric Service Co., Postal Telegraph Building, New York, are the manufacturers.

An electric ventilator has been devised, says an exchange, for supplying buildings with fresh air, cold or warm, as may be desired. An electric motor sets the ventilator revolving, and the revolution sucks cool air in. When warm air is desired, a current of electricity is sent into a network

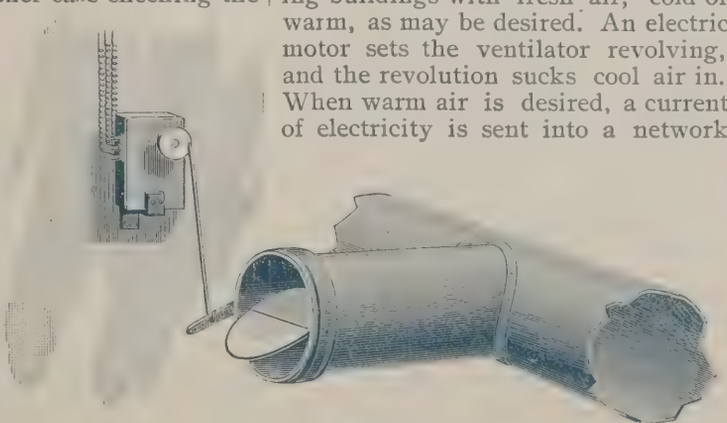


FIG. 3.

of fine wire, through which the air must pass, heating the wires, and these impart their heat to the air.

Cause of School Boiler Explosion.

Investigation of the steam boiler explosion which occurred at the Centre Grammar School at Uxbridge, Mass., on Nov. 22, endangering the lives of 200 children, has shown that it was due to defects in the construction of the apparatus. Thomas Hawley, of Chief Wade's staff of State boiler inspectors, made the investigation, of which the following is a report:

The exploded boiler had been in use about 15 years. It was of cast iron, nearly square in shape, with an internal fire box extending the length of the boiler to the rear water leg. The grate was not as wide as the fire box, the heated gases passing over each side of the grate under the bottom of the water leg and along the external shell to the flue.

The boiler was composed of two independent sections over and surrounding three sides of a single grate, the sections being connected only by circulating pipes. The first section was 26 inches long by 40 inches wide, and the second section was larger, being 28 inches long by 40 inches wide. The top of the fire box was slightly crowning and was provided with a fusible plug, and the top of the external shell of each section was slightly crowning. A cover was bolted on the center of the top of each section, and from these covers steam risers were taken.

The second and larger section gave way, blowing the top of this section completely off, one piece weighing over 100 pounds. The line of fracture was from 2 to 4 inches from the sides of the boiler. The boiler plate varied in thickness from ½ to a scant ¼ of an inch.

An examination of the fracture shows that it started from two cracks, one about 4 inches long at the rear, on the right hand side facing the boiler, and a smaller crack at the front right hand corner. These cracks were evidently caused by the bulging of the top by the pressure beneath it, causing the plate to rise and fall with every change in pressure, finally cracking at the bending point. The crack had been bleeding, and evidence of the leak were on the external shell, and I do not believe were of very long standing. The front plate gave way at the larger crack, this being clearly shown by the position in which the broken piece was found, and also from the position of the steam riser pulled from this section by the explosion.

From the statements of the janitor, it appears that he left the school at 8:45 o'clock, having another school to attend to. He left 4 pounds pressure upon the boiler, a heavy, hard coal fire, with the furnace door closed and the automatic damper open, which was expected to close the draft door with an increase in pressure. The boiler supplied steam coils in six rooms, four of which were occupied.

The day was warm, and all the coils but one were shut, hence there was almost no demand for steam, and a heavy fire on the grate, which, with the fire door closed, would continue to burn freely for a long time after the draft door was closed.

The safety valve was 1¼ inches on a ¾-inch pipe, making practically a three-quarters safety valve, and this was totally inadequate to discharge the steam as fast as produced, without an increase of pressure. That this is the case was also shown by an experience of the janitor last winter, when he returned to the boiler and found the safety valve blowing freely, set at 7 pounds, yet the pressure on the boiler was 20 pounds, to which it had risen despite blowing off.

All the conditions were present to bring about a heavy pressure on the boiler. A heavy fire, no use for the steam made, a safety valve totally inadequate to relieve the boiler, leaves no other conclusion than that the pressure reached a point unusually high with this boiler, and in the cracked condition of the plate, the explosion was the natural result.

Even with the crack and the high pressure at which this boiler exploded, it might still have held had not the boiler been naturally weak. The boiler itself, under any condition, is faulty in design and an unsafe one to use. The large section was almost flat on top, 20 by 40 inches, in places less than ¼ of an inch thick, of cast iron, and this large surface was not stayed in any adequate manner.

Deducting a ring 4 inches wide, as supported by the vertical sides, it leaves an unsupported, practically flat plate, with an area of 800 square inches, which, with 10 pounds pressure on the boiler, would bring a load of 8,000 pounds on this unsupported plate. With 20 pounds pressure, at which the janitor has found it, the load would be 16,000 pounds, or eight tons.

If a man should set up a plate of thin cast iron, supported only on the sides, 20 by 40 inches, and expect it to support a movable load of eight tons, the foolhardiness of the attempt would be instantly condemned by every observer; yet that is exactly what was done with that schoolhouse boiler; how often, no one knows, but very frequently known to be very near that load. Not only is the strain dangerously excessive, but it acts to crack the boiler exactly as it could have been predicted it would.

In setting the boiler it was not furnished with check valves to prevent the loss of water by a failure to close the radiator return valves. This, however, has nothing to do with the explosion, but is dangerous, and is liable to produce low water, and is a common condition in schoolhouses. The fusible plugs, found melted, show it to have been in working condition, but they did not melt until after the explosion, which indicates that there was plenty of water in the boiler when the explosion occurred.

To summarize: The direct cause of the explosion was a considerable increase in pressure in the boiler, made possible by the safety valve being defective in size, and a faulty boiler, presenting a large unstayed flat surface, further weakened by being cracked, the direct result of its faulty construction.

The Transmission of Heat.

Heating a building properly calls into requisition not only practical every day experience in the business of pipe fitting and furnace setting, says the Pacific Builder, but also a thorough understanding of the laws governing the production and the communication of heat. As heat is the force, so cold is the absence or diminution of this force. It is produced by a mode of motion through particles of matter, whether gaseous, solid, or liquid, and is communicated in three ways, viz.: by radiation, conduction, and convection. The radiation of heat, of which the warmth of the earth is an illustration, is the transmission of heat from one body to another through gases, the heat always passing in straight lines and with great velocity. Conduction consists in the passage of heat from one particle of a substance to another through insensible distances. By convection we mean both conduction and radiation, as when heat is carried from one point to another by moving particles in liquids and gases. It should not be forgotten that in liquids and gases there is very little, if any, conduction of heat, and that radiation does not warm the air through which it passes. But while heat is not transmitted from one particle to another in gases and liquids, but depends for dissemination chiefly upon the movements of the particles, it is readily transmitted between them and solids. This is the whole secret of many difficulties in heating, and explains the futile attempts on the part of many purely practical workmen to heat rooms without the necessary attention to circulation. When warm water, steam, or hot air is used it is absolutely necessary that a proper circulation is maintained so that every particle of air or water comes successively into contact with the heated surface of the furnace or radiator. Many persons cannot understand why their rooms, although "perfectly tight" are yet but partially heated, even with a great consumption of fuel. To understand it thoroughly it is only necessary to remember the theory of the communication of heat by convection. For just as warmth and fuel may be wasted by too much ventilation, so they may be also thrown away by a lack of it; and it is only the expert heating engineer, trained both in the practice and in the scientific theory of his business, who is fully competent to meet all the requirements of modern house heating and guarantee satisfaction in every instance.



Cheap Gases.

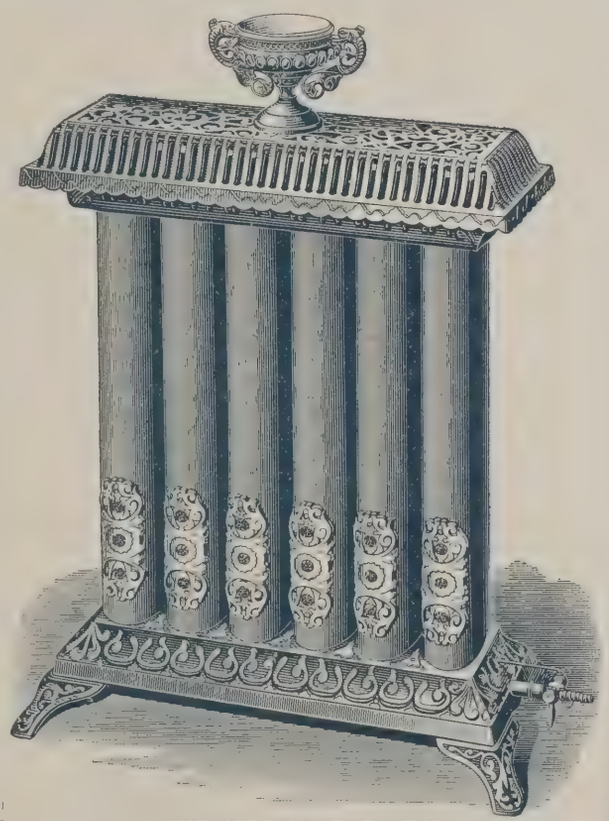
Interesting information on the value of cheap gases as a fuel for heating and cooking purposes is presented in one of our English contemporaries, by T. Fletcher, a well-known gas expert, who writes as follows:

That cheap heating gas for domestic cooking and warming purposes is once more coming to the front, is apparent. The use of gas made by a simple, cheap process, for heating purposes only, has been very strongly advocated by many who have not properly faced the whole question, and it is desirable that the actual facts and figures should be fully considered. Of the gases available for these purposes there are three. "Producer gas" is a mixture of carbon monoxide with inert nitrogen and carbonic acid. It is extremely bulky, and so low in power as to be useless for domestic purposes. "Water gas" is a mixture of hydrogen and carbon monoxide. It is very powerful in heating, very poisonous if inhaled, and cannot be manufactured alone without the production of large quantities of poorer gas, making the process a very costly one where water gas only is required. "Dowson gas" is a mixture of the two previously mentioned, and is made by a very simple process.

I think I quote Mr. Dowson correctly in stating that this can be produced at a cost of 8 or 9 cents per 1,000 cubic feet, including all costs, delivered into the holder, the heating power averaging one-third that of ordinary London coal gas. At this rate, comparing the two and taking ordinary gas at an average price of 75 cents per 1,000, the same heating power could be obtained from Dowson gas for 27 cents. This is the way the enthusiasts consider the question, ignoring the fact that ordinary coal gas, unpurified, could be delivered into the holder at about the same cost. We must, however, take the whole of the facts into consideration. The use of unpurified gas in any ordinary household is out of all question, and this process costs within a fraction of 2 cents per 1,000 cubic feet. The delivery of gas into the holder is only a part of the problem. Taking the average of the London gas companies the following additional costs are incurred per 1,000 cubic feet sold:

Depreciation charges	3.1 cents
Rates and Taxes	3.5 cents
Distribntion	4.3 cents
Purifying	1.84 cents
Interest on capital	2.76 cents

15½ cents per 1,000 cubic feet. There is no reason to suppose that the costs on heating gas would be smaller. No doubt the interest on capital and depreciation charges would be less, but the distribution would be very much greater, as the mains would require to be three times the size for the same work. This could not be overcome by increasing the pressure, as the leakage would increase in proportion, and we are compelled to face the fact that the Dowson gas, delivered to the consumer, would cost over 25 cents per 1,000, without showing any margin of profit, and this means, for the same power obtained, a cost at least as great as the present cost of coal gas. When we consider that leakages of Dowson gas are dangerous, owing to its extremely poisonous nature, and that an entirely new series of distribution mains and special house service pipes would be required, it is evident that the attempt to introduce anything of the kind can only end in failure. It is not by any means a question of the cost of production only, as this is only one item to be considered, and the users of coal gas for heating and cooking purposes may rest content that the introduction of heating gas would not be an economy. That it would be dangerous on account of its poisonous nature is very well known, and although there is no doubt that Dowson and other heating gases have a distinct value for special commercial and manufacturing processes, their introduction into dwelling houses is anything but desirable.



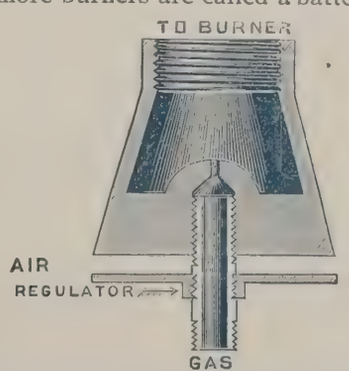
THE CORT GAS RADIATOR.

The Cort Gas Radiator.

The illustration presented herewith shows a new gas radiator that is being put on the mrket by J. H. Cort & Son, Adams and Water streets, Brooklyn, N. Y. In appeaarnce the radiator is made attractive by symmetrical outline and the treatment of the cast iron parts. The base which supports the planished iron heating tubes is handsomely ornamented, and the casting at the top is of an equally attractive style. At the base of the heating column an ornamental casting is used as a setting for colored glass jewels, through which the gas flames send the light in many colored rays. A handsome urn is used as a top ornament of the radiator, and is designed to hold water to be evaporated to supply moisture to the apartment, in deference to the opinion that a gas radiator has a tendency to dry the air in an apartment, making artificial moisture necessary. The burner is arranged with a pilot light for use in lighting. Immediately below each of the heating columns is a gas flame, and the heating columns are provided with inner tubes which extend nearly to the top, through which the heated products of combustion rise and heat the top of the radiator, and then, as there is no outlet at the top, they descend on the outside of the inner tube to the bottom of the radiator and are discharged at the floor, thoroughly heating the radiator. By this means the lower portion of the radiator and the room are well heated. The radiator is made in several sizes, with either direct draft or reverible flue, and with from 4 to 8 tubes.

Fuel Gas Burners.

A number of new specialties for water and gas heating, which will be of much interest to the heating trade, are being manufactured by M. J. O'Rielly, 174 West Genesee street, Buffalo, N. Y. The accompanying cut shows the O'Rielly single flame burner for heating hot water or generating steam in boilers having fire boxes of the square type. Five or more burners are called a battery, and

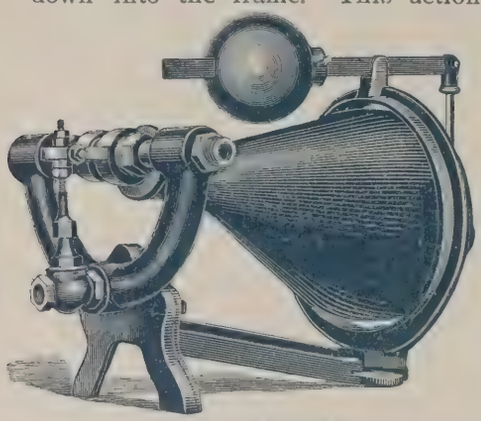


can be made into a solid or jet flame. Besides the burner shown, a large variety of others, for all purposes, are made by the manufacturer.

NEW SPECIALTIES.

BUNDY TANK TRAP.

The general principles upon which this tank trap is constructed are the same as those mentioned in the description of the Littlefield steam trap in our December (1893) issue. It is designed for discharging the water into an open tank, sewer, or other repository. Briefly its action is as follows: When the pressure is turned on the coils the bowl soon fills with the water of condensation; the weight of the ball is overbalanced, and the bowl settles down into the frame. This action

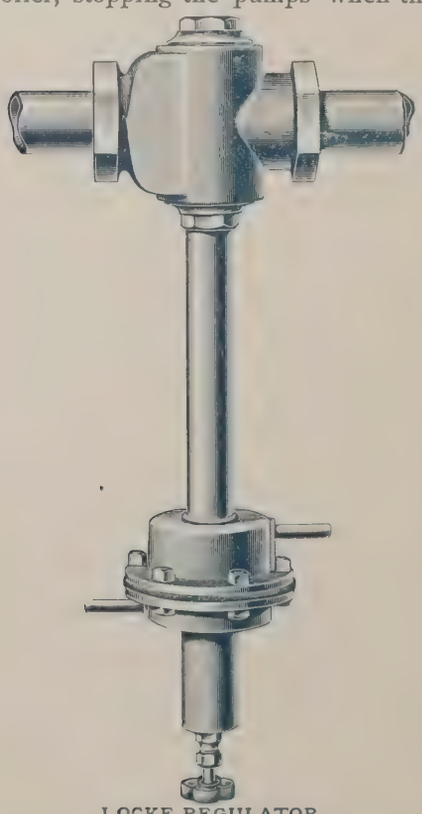


BUNDY TANK TRAP.

opens the escape valve, allowing the bowl to discharge its contents. The bowl, being thus relieved of the weight of the water of condensation, is overbalanced by the weight of the ball, and is raised again from the frame, closing the valve. The A. A. Griffing Iron Co., Jersey City, N. J., are the manufacturers.

LOCKE BOILER FEED PUMP REGULATOR.

The regulating valve shown by the accompanying cut is designed to maintain a water pressure above that of the boiler, stopping the pumps when the



LOCKE REGULATOR.

pressure exceeds that for which the regulator is set. The operation of the regulator fluctuates with every change of pressure in the boiler, so that the water is always maintained at the same relative higher pressure, regardless of the boiler pressure. The difference between the water and the boiler pressure can be changed by turning the hand-wheel at the bottom of the regulator, and a very even water line may be kept by properly setting the feed valves. The Locke Regulator Co., Salem, Mass., are the manufacturers.

QUEEN THERMOMETERS.

These thermometers are graduated from 60 to 220 degrees, but to prevent bursting, should they be subjected to a higher temperature, a safety chamber is blown in the top of the tube, which will admit of further expansion of the mercury to 300 degrees. The terms, moderate, cold, and extreme, are intelligible to any house servant, and have the advantage of being adjustable, as shown, being set by the engineer who installs the boiler to conform to the exigencies of the case. Season tubes with lens or magnifying faces are used, the scales being black with white figures and graduations, or silver finish. Fig. 2 is an angle thermometer for use where the straight form shown by Fig. 1 cannot be applied. Fig. 3 shows the Queen steam-guage thermometer, of the same construction as the hot water thermometer, except that the scale is graduated to 270 degrees, and shows an equivalent of 30 pounds pressure on the opposite side of the scale. Queen & Co., 1010 Chestnut street, Philadelphia, manufacturers.



FIG. 1.



FIG. 2.

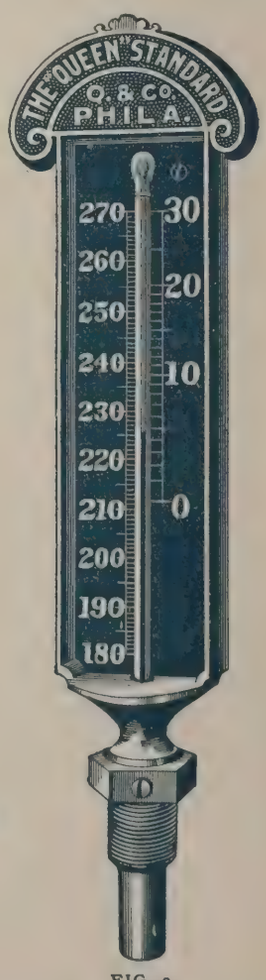


FIG. 3.

FOSTER F. P. BALL VALVE.

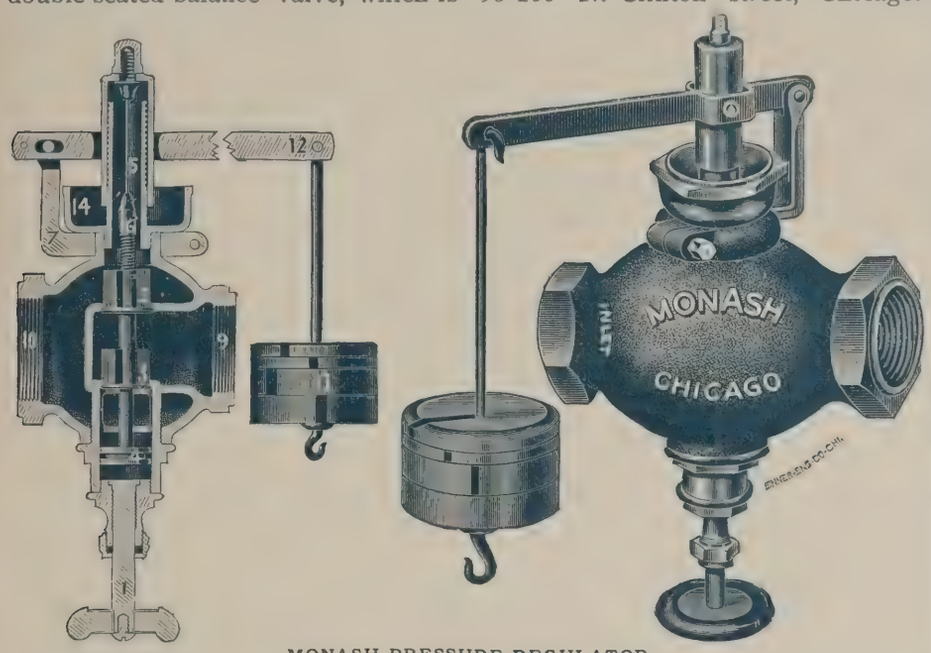
This valve closes automatically and instantaneously under any pressure without the aid of springs, and in the direction of the flow. It opens and



closes with a variation of but ½ of an inch in the water level, and will not siphon water from tank. For this valve a float 4 inches in diameter, attached to a lever 10 inches long, will be found sufficient to operate any size valve from ⅜ to 6 inches inclusive. The float may be adjusted at any angle by the thumb-nut partially shown by the cut. The wear on any portion of the valve, which is noiseless in operation, is inappreciable. Walworth Mfg. Co., Boston.

MONASH PRESSURE REGULATOR.

The pressure regulator, or reducing valve, shown by the accompanying exterior and sectional views, has a double seated balance valve, which is positive in action and so constructed that there is little or no friction, thus obviating danger of sticking. The seats are of conical shape, and are ground perfectly tight. The device contains no diaphragms or springs, and is noiseless in action. The outlet is made larger than the inlet, and a hand wheel at the bottom is provided for closing the regulator off tight. There is no dash pot or oil cylinder, and no waste pipe. The lever which holds the weights can be adjusted at any angle, thus obviating the removal of steam pipes or the cutting of timber to find room for the regulator. The



MONASH PRESSURE REGULATOR.

Van Auken Steam Specialty Co., 201-207 S. Canal street, Chicago, are the manufacturers.

WRIGHT PUMP GOVERNOR.

The cuts presented herewith show a new governor recently placed on the market by the Chicago Regulator Co., 96-100 N. Clinton street, Chicago. Fig. 1 is a sectional view of the well-known Davis pressure reducing valve, which the makers of the governor have been licensed to use. As shown by Fig. 2, the water pressure inlet is placed below the water piston, opening into a chamber in which sediment is collected. The weights used balance the steam pressure carried in the chamber O, Fig. 1, and the pressure of the water in the water cylinder shown in Fig. 2. Should the water pressure decrease, the lever falls, thus opening the steam valve and increasing the pressure under the piston D, Fig. 1, and compensating for loss of water pressure. Whenever the water pressure falls to so low a point that the boiler pressure is not sufficient to equalize the loss in water pressure, then the full boiler pressure is carried on the pump. As frictionless packing is used there is little friction to overcome, the manufacturers claiming that the device is positive in action, is without dead ends, and does away entirely with all shock or jar in the machinery.

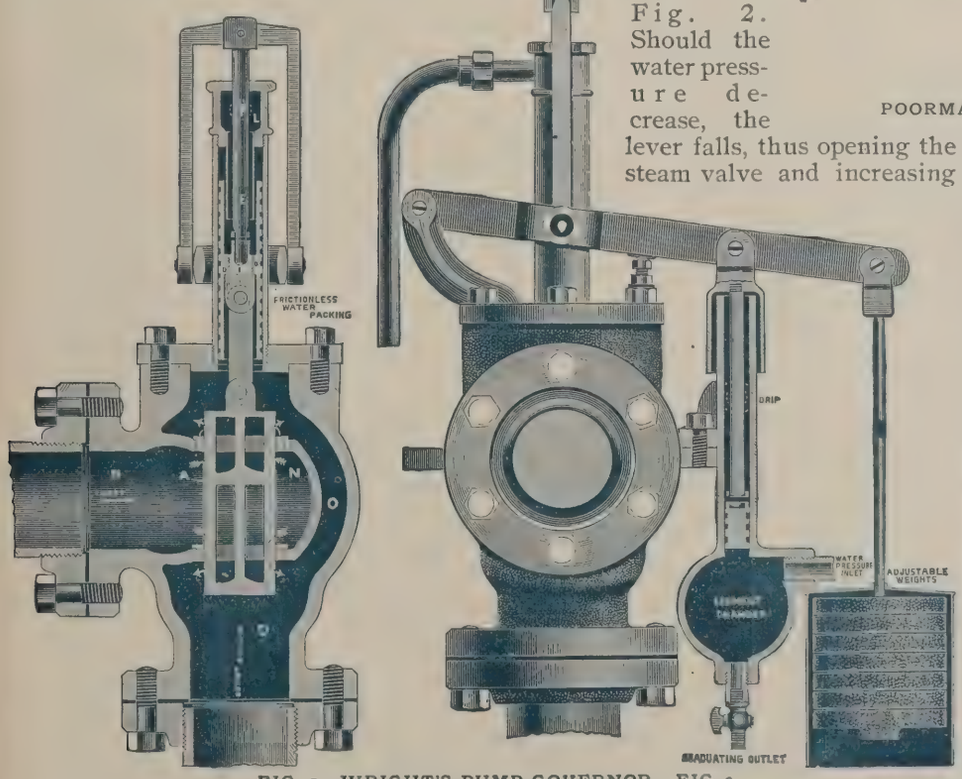
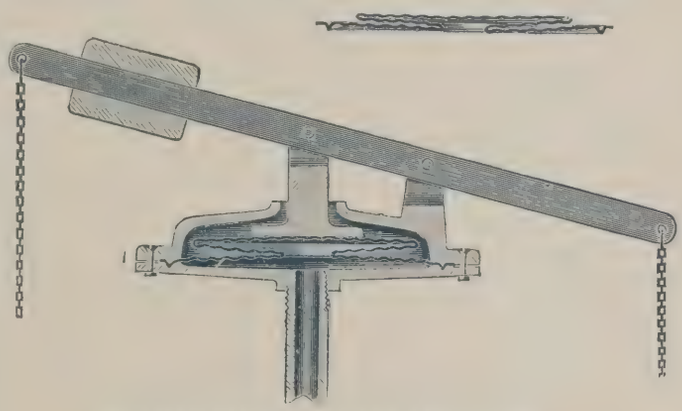


FIG. 1.—WRIGHT'S PUMP GOVERNOR.—FIG. 2.

POORMAN SAFETY DAMPER REGULATOR.

The accompanying sectional cut shows the internal construction of a damper regulator made by the Poorman Manufacturing Co., Canton, O. It is designed for use on low pressure steam boilers for house heating, and is arranged to open and close the check damper and draft door so as to maintain the fire in a proper condition, and keep the boiler steaming to supply the radiators, without waste of fuel. The diaphragm is made of three copper disks, the lower one forming a packing between the plates of the regulator. The lower plate has an annular V-shaped groove on its outer edge, and the upper plate has a corresponding V-shaped projection to fit into it, holding the lower disk securely in place in a steam tight joint. The center disk is double seamed and soldered to the bottom disk near the center, having a 1½-inch aperture. The top disk is solid and fastened in the same way to the outer edge of the center disk. The disks are corrugated to give them spiing, and in the large view are shown as an expanded diaphragm, and in the small view they are shown in their normal condition. The diaphragm is said to be very flexible and sensitive, and durability is claimed to be one of its strong points, it not being liable to give way from weakness when under a maximum pressure during a cold spell and heavy firing



POORMAN SAFETY DAMPER REGULATOR

The best place from which to draw off steam for a calorimeter determination is from a vertical pipe.

A pump should always be run so that it will fill at every stroke. There is great wear and tear induced by the thumping of half-filled cylinders.

Wherever a pump is to be used it pays to have a reliable one from a good maker, and give it some attention, not running it on the idea that it will run itself.

Heating and Ventilation

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BOILER explosions, such as that in the school at Lawrence, Mass., mentioned in another part of this paper, are object lessons to the manufacturers of steam boilers, distinctly emphasizing the fact that the manufacture of boilers cannot be carried on under the rule of "trial and error," as the absence of data on the construction of such apparatus would seem to indicate has been the case in many instances.

THE Master Steam and Hot Water Fitters' Association of the United States, with headquarters in the Cable Building, New York, have done the correct thing in abolishing the right of any trade paper to claim official organship by publishing an official bulletin of their own. This is in line with the policy pursued by all the leading associations, and places each journal upon its merits before the trade. We congratulate Chairman Wells, and assure him that he has our best wishes, and that our columns are open to help along the association in every possible way at any time.

JAMES A. HARDING, who is well known in heating circles as an engineer of marked ability, after an active service of eighteen years, the latter part of which was spent with the Boynton Furnace Co., of New York, has severed all his business connections, and is now enjoying a well-earned rest at his home at Vineyard Haven, Mass. Mr. Harding is widely known as a contributor to the technical press, and has thus furnished the trade with much valuable practical information on hot air, hot water, and steam heating. We had the pleasure of illustrating some of Mr. Harding's work, in our last issue, in connection with the description of a modern hot water heating plant, designed by him for an elegant residence at Belle Haven, Conn. In severing his connection with the above named company that firm lost an engineer who will be hard to replace. Compared with the duties of the office, however, gunning became too attractive, and though Mr. Harding is now engaged in the pursuit of pleasure as a business, he will be glad to hear of the doings of the heating trade through his many friends, who unite in wishing him as much success in that pursuit as he has attained in his career as a heating engineer.

ECONOMY and efficiency are the two prime requisites in any system of heating and ventilation, and to secure both with the least first cost and current expenditure, is the problem which every heating and ventilating engineer has to solve afresh, according to the circumstances under which the particular system he is called upon to design is to be installed and operated. For ordinary dwellings, natural systems of ventilation possess sufficient certainty n results, and are of such efficiency as to warrant their installation in preference to mechanical systems. Natural ventilation involves a much less first cost than does mechanical ventilation, but the latter is cheaper for use in large schools, theatres, hospitals, and large office and public buildings, where a positive system of the highest efficiency is a necessity. Between the requirements which determine the character of the ventilation of our homes, however, and those determining the system for such large buildings as are mentioned above, there is a long range of intermediate requirements, in successfully meeting which demonstrates the ability of the engineer.

VARIOUS applications of the thermostat are being developed as it becomes more generally introduced. First applied, as it was, to direct or simple indirect coils with natural air circulation, the difficulties in the way of successfully opening and closing steam and drip valves were surmounted with comparative ease. But whenever a much larger volume of air is forced across the coils by mechanical means the difficulties increase. This is particularly the case with primary heaters where there is a ready opportunity for freezing or hammering due to the operation of these valves.

UNDER such circumstances by-pass dampers may be easily introduced and operated, so that the change in final temperature results from a mixture of hot and cold air, rather than from a reduction of the heating surface. Such a damper may be introduced, in some cases, as the principal and only means of control, but in many instances temperature regulation is required in a number of independent rooms, and it is desired to avoid a double system of ducts, one conveying hot air and the other cold air, to the base of each flue, there to be combined by a mixing damper.

THE DESIRED result may be readily accomplished by providing two adjoining chambers in connection with the heating apparatus, into one of which there is forced warm air, and into the other tempered air. From these chambers connections are made with each of the individual pipes to the various rooms. A damper in each pipe, controlled by a thermostat in the corrresponding room, serves to admit air from either one of the chambers according to the requirements. In substance, this plan consists in massing all of the mixing dampers at the heating apparatus and leading therefrom to the various flues as many pipes as there are flues, each pipe being so connected with the hot or cold air chambers as to convey hot or cold air, as the thermostat may determine.

What is a Heat Unit?

When in ordinary conversation, a person uses the word "heat," there is often some uncertainty about the precise meaning that he intends to convey by it. This uncertainty arises partly from the many figurative meanings of the word, but principally from a confusion of heat, properly so-called, with "temperature." For example we speak of the "heat of the day" meaning that part of it which is hot—*i. e.*, the middle of the day. Again we speak of the "heat of the furnace,"—meaning really, the *temperature* of the furnace. In the expression "animal heat," on the other hand, the word heat is possibly used in its strict sense, and we understand it to mean a *quantity* of some sort or other, which could be measured just as definitely as wood or potatoes can be, if we could only devise some appropriate unit by which to perform the measurement.

In order to get a somewhat clearer idea of the difference between heat and temperature, let us consider a tub of hot water. A thermometer immersed in this water reads, say, 200 degrees F., and under these circumstances many of these persons would say that the water "contains 200 degrees of heat." Now, nothing could be more misleading nor more erroneous than such a statement as that. It should be observed that the only thing we have determined is the *temperature* of the water, and the thermometer would read just the same whether the tub contained a pint of the water, or 40 gallons of it, or a thousand oceans of it. If one should find that a thermometer plunged in the Atlantic Ocean gave just the same reading as a similar one immersed in a gill measure, he surely would not say that the gill of water in his hand contained as much *heat* as the whole Atlantic Ocean. His observation would indicate that the *temperature* of the two were alike, but that is all.

In order to determine the amount of heat in a given body of water, we must first decide upon some convenient *unit of heat*, and then we must find out how many of these units would be required to raise the given mass of water from the freezing point to the given temperature For example, we might adopt as our unit of heat, the heat required to melt one pound of ice; and we could then determine how many pounds of ice the given mass of water could melt, in cooling from the observed temperature down to the freezing point This method of procedure is quite satisfactory for laboratory purposes, and various forms of apparatus have been devised for putting it into practice, some of which enables us to measure quantities of heat with great precision. Valuable as these "ice calorimeters" are in the laboratory, they are of little or no use to the engineer, because ice is often expensive and difficult to obtain, and because the apparatus necessary to insure accuracy in measuring large quantities of heat by this method would be so cumbersome that it could not be transported from place to place.

For general use in engineering, we are obliged, therefore, to adopt some other unit for heat measurement. We might, for example, define a "unit of heat" as the quantity of heat required to raise the temperature of a pound of some given substance one degree; and, in fact, this is the kind of unit that is actually used in practice. We could base the proposed unit on any substance we choose, but as the water is both cheap and convenient, and as it can nearly always be obtained in a condition of reasonable purity, it has been adopted by universal consent; and a "heat unit" is defined to be that quantity of heat which will raise the temperature of one pound of water one degree.

Before we could adopt any such general definition as this, we should have to find out whether or not it takes the *same* quantity of heat to raise the temperature of a pound of water from, say, 39 to 40 degrees, that it does to raise it from, say, 210 to 211 degrees. If this is not the case, it will be necessary to modify our definition of a "heat unit" to the extent of specifying at what temperature the pound of water is to be taken. To guard against a possible ambiquity of this kind, some writers define a heat unit as "the quantity of heat required to raise the temperature of a pound of water from 39 to 40 dergees," while others define the temperature range to be "from 32 to 33" degrees, and others "from 59 to 60 degrees."

In order to judge of the importance (or unimportance) of specifying the temperature of the water in defining the heat unit, let us examine some of the experimental data that have been obtained relative to this point. If the heat required to raise the temperature of a pound of water one degree were the same, all the way from the freezing point to the boiling point, it would follow that if we should stir together two pounds of water, one of which is at 212 degrees and the other at 32 degrees, the temperature of the mixture would be be $\frac{212 + 32}{2} = 122$ degrees; and conversely, if the temperature of the mixture is found to be *different* from 122 degrees, we should know the quantity of heat required to raise the temperature of a pound of water by one degree is *not* the same at all points on the thermometer scale. Careful experiments, performed after taking all possible precautions against loss of heat by radiation and conduction, have shown that when a pound of water at 212 degrees is mixed with a pound of water at 32 degrees, the temperature of the mixture is 122.29 degrees. This shows that the quantity of heat required to raise the temperature of a pound of water one degree is *not* the same at all points of the thermometer scale, but it indicates, at the same time, that the total variation between the freezing and the boiling point is very slight Similar experiments, made by mixing water at other temperatures, give this same result, and hence we conclude that although a "heat unit" is not the same at all temperatures, the variation in its value is so slight that for the most purposes it can be neglected. In calculating tables of the properties of steam and water, allowance is made for the fact that the "specific heat" of the water is not the same at all temperatures; but in all the ordinary work of testing boilers and engines, and laying out steam plants and heating systems, it is customary to consider the specific heat of the water to be *constant*; and the heat unit is defined simply as "the quantity of heat that will raise the temperature of one pound of water one degree."

When we say that a pound of steam in condensing, gives out 967 heat units, we merely mean that it gives out an amount of heat that would be sufficient to raise the temperature of 967 pounds of water one degree, or 96.7 pounds of water 10 degrees, or 9.67 pounds of water 100 degrees, etc. Similarly when we say that a pound of good coal gives out 14,000 heat units when burned, we mean that each pound of the coal can heat 14,000 pounds of water 1 degree; or 1,000 pounds 10 degrees, or 140 pounds 100 degrees, etc. And finally, when we say that the "mechanical equivalent of heat" is 779 foot-pounds, we only mean if a weight of 779 pounds should fall one foot the work it would do would be just sufficient to raise the temperature of a pound of water one degree; and, conversely, if we could utilize (by means of a steam engine or otherwise) all the heat that a pound of water gives out when it cools one degree, this heat would be just sufficient to raise a weight of 779 pounds through a height of one foot.—The Locomotive.

There is a tendency toward larger sheets for boiler construction, and the general effect is for the better although thereare some few objections. By this method the whole bottom sheets of the boiler are constructed of one piece, and there are no riveted seams to leak nor rivet heads to obstruct in cleaning. With these large sheets there is absolutely no excuse for dirt being left in the bottom of the boiler, as, there being no obstuction the cleaner will know that any obstruction is dirt and not rivet heads or seams.

A new system of smoke absorption has been applied in Glasgow. Before entering the usual chimney, the gases ascend a short brick flue, and then descend a flue of steel plates dipped at a high temperature in a tar composition, entering the chimney at the bottom. At the bottom of the ascending flue is a jet of steam at boiler temperature, while at the top of the descending flue is a fine spray of water. The carbon is thus separated, and with the water drops to the foot of the descending flue, passing off in pipes.

LETTERS FROM PRACTICAL MEN.

Correspondence from practical men upon topics of interest relating to Heating, Ventilating, and kindred subjects, will find a place in this department. The editors, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

Noisy Pump Action.

The writer would like to ask the reason and remedy for noisy pump action, when boiler feeding pumps take their supply either from a heater with hot water, or an overhead tank with cold water. It does not seem to make any difference what class of pump is used, the same trouble occurs with direct acting, fly-wheel, and belt pumps, and a flow of only a few inches sometimes causes hammering that would seem to knock the whole pipe system down, while the pump is moving at a very moderate speed at that.

I don't think this subject has been brought to press notice before, and am sure you would confer a great favor on a large class of sensitive engineers by offering a solution or general correspondence on the problem. ECCENTRIC.

Hints to Young Engineers.

Those who are called upon to take charge of boilers away from the city and city appliances, and have doubts about the safety of the boilers, can test them with hydraulic pressure in the following manner: First, fill the boiler to be tested with water to the safety valve. Weigh the safety valve down with from 30 to 50 pounds more than the steam pressure at which you want to run. Then, if you have other boilers, run your feed pump sowly until you discharge water out of the safety valve. If you have no other boilers rig something to work by hand, and if you have no pump fire up the boilers with a small fire until the water is discharged from the safety valve. If the boiler stands the test you can consider it safe. Having described how to test a boiler, I will try to describe how to run it under difficult conditions. All outside attachments, such as gauges, safety valves, etc., should be plainly visible, and if they are not it is the engineer's fault. What I wish to show is the danger of long runs with bad water. For example, I will take a five-foot boiler, from 30 to 36 feet long, with return flues. Everything being in order we will commence our daily run, stopping at night and commencing with fresh fire in the morning. Many days pass before the engineer thinks it dangerous to run longer and when he does think so he sometimes has to combat with ignorance and capital in refusing to run longer without cleaning his boilers. Sometimes the engineer loses his job, but if he runs he is in danger of losing his head as well as his job.

Now we will reason on things we do not see. What is going on inside of the boiler when making steam? Over the fire just in front of the bridge wall is the hottest part of the boiler and more steam to the square foot is made there than in any other part, consequently there is a current of water flowing towards this point and carrying mud or sediment with it. So long as the boiler is making steam this action is taking place, but when the fire is drawn the mud begins to settle on the bottom of the boiler, where it becomes hard, and finally produces mud burning. I have seen a boiler bagged in two weeks and I have seen a boiler run 37 days without the least danger, both boilers being run under the same conditions and at the same place. A little fire was kept up all night under the last named boiler so that the mud could not settle. This, I think, prevented bagging of the crown seat, such as that described in the September issue.

I was once familiar with the rules governing the motive power of two of our large railroads. One railroad provided each engine with a book, and the engineer was required to clean his boilers at the end of every ten trips, putting down in the book the time when the boiler was cleaned, and by whom, sending the book to the office to be signed. A case of mud burning on that road was never known. On the other railroad the cleaning was left to the engineers, with the result that I have seen sheets bagged the whole length of the fire-box between the stay bolts. At one time the foreman pointed out to me an engineer who could do more work with an engine than any man on the road, and I also learned that he had burned out four fire-boxes.

A. WILLIAMS.

Wasteful Use of Exhaust Steam.

As Mr. Jay M. Whitham has a letter in the November issue, in which he says that my statement is entirely incorrect, I wish to say a few words in reply.

I did not read his letter in a hurried manner, and have made no incorrect statement on the subject. I would ask Mr. Whitham to not only carefully read my letter in the September issue, but to study it as well, for, judging by his communications, he does not fully understand the subject in all of its details. If the mean effective pressure was 40.7 pounds at one time and 39.3 pounds at another, and the back pressure was 10 pounds more in one case than in the other, the total actual load on the engine could not have been the same, but was much greater in one case than in the other.

When the total actual load on an engine is to be taken into account, it is based on the average pressure on the piston, measured from a perfect vacuum, and not on the mean effective pressure.

This matter is apparently not well understood by many engineers. If the mean effective pressure is 40.7 pounds, and the back pressure above the atmosphere is 10 pounds, then the average forward pressure on the piston is 10 pounds more than when the mean effective pressure is 39.3 pounds with no back pressure above the atmosphere. The natural consequence is that it requires more coal to run with a heavy load than it does with a lighter one, and there is nothing mysterious or incorrect about it.

Mr. Whitham says in one place that the average indicated horse power was 180.6 for one test and 176.5 for the other. In another he says that he secured the same general result with another engine, on which he made two tests, and tells us that during each test the work done was the same, although there was a difference of 10 pounds in the back pressure. This is a mistake, for the indicated horse power of an engine, and the work done by it are never the same, any more than the mean effective pressure and the average pressure on a piston are the same. The title of Mr. Whitham's first letter is "Wasteful Use of Exhaust team," but so far he has not demonstrated that it was wasteful.

W. H. WAKEMAN.

Ventilation.

I was asked to prepare a short article on ventilation for a meeting of school trustees and teachers, to consider the matter in a simple way, freed from scientific vagaries, with a view of getting something done in our common school house. As the inclosed article was prepared on a very busy day it may be open to criticism, but it is fairly good as far as it goes.

Ventilation may be simply defined as a process of supplying pure air to a room and getting rid of the impure air at the same time. Ventilation and warming must necessarily be considered together, as artificial ventilation, without the use of machinery, must be accomplished by means of heat. Natural ventilation may be obtained by opening windows in opposite sides of a room. Pure air will come in at one opening, and the vitiated air will go out of the other, according to the direction of the air currents outside. This form of ventilation will do in summer, but not when the outer air is too cold to be brought into the room.

This fact must always be remembered—that a room always contains the same volume of air. It is full. You cannot increase the quantity, neither can you diminish the volume. Therefore, if air is taken out of a room by any device, and no special opening is provided for the ingress of pure air to replace that taken out, the air must come in as best it can through crevices in the windows and doors. On the other hand, warm air will not come into a room through furnace pipes any faster than air can escape from the same room. This is the reason it is so hard sometimes to warm a dwelling with a warm air furnace when there is no ventilation.

It is a wise law of nature that the most impure and coldest air is at the floor of a room. The purest and warmest air is near the ceiling. House ventilation should be planned to get rid of the cold and impure air, and in this way ventilation will assist in the heating by getting the cold air out of the way and allowing the warm air from the ceiling to descend and warm the room. A room is always warmed from the top downward, the warm air from whatever source rising at once to the ceiling and settling down as it is cooled. It is also important that the pure air which is introduced into a room to take the place of the air sent out should pass over a heated surface of some kind on its way, so as to come into the room warm.

The fact that air when heated will rise and when cooled will fall is taken advantage of to effect ventilation. Flues may be properly built and openings properly made, but the air within the flue will be as likely to descend as to rise, if it is not artificially warmed. Any flue in the wall, having an opening at the floor into a room, and extending up through the roof, will make a ventilating flue, if the air within the flue is warmed in some way. A good way is to construct a chimney with two flues, one for the smoke flue of the heatin apparatus, the other for ventilation. The heat from the smoke flue will warm the ventilating flue so that the air within the flue will rise and escape and, of course, draw the air from the room through the opening at the base. A still better way is to build a large chimney, 12 by 20 inches inside is about right for a large country schoolhouse, and use a cast-iron smoke pipe 8 inches in diameter, placed inside the flue when it is built and extending to the top. The space inside the brick flue and surrounding the smoke pipe makes one of the best ventilating flues known, as the cast smoke pipe will warm the air in the flue much more than one side of a brick flue possibly can.

Leaving out of consideration the large heating and ventilating apparatus, too costly for general use, the best school-room heater is a warm-air furnace of suitable size. This heater can be set up in one corner of the room out of the way, no matter where, if smoke flue is near. I should be set a few inches above the floor with a case open at top and bottom. When in operation the air inside of the case becomes heated and rises to the ceiling and the cold air is drawn in at the bottom, and this circulation will continue as long as there is fire in the heater. This circulation is not ventilation; not a bit of it. The temperature in all parts of the room, at same height from the floor, will be the same whether the room is warm enough or not. When the room is warm scholars close to the heater will not be too warm, and those in distant parts of the room not too cold, as is the usual way.

To complete the arrangement properly there should be a ventilating flue suitably warmed, and also a cold-air flue of the same size from the outer air brought with the opening directly under the heater. Then the air which comes into the room to take the place of the foul air sent out through the ventilating flue, will come in warm as it should, instead of coming in cold through the crevices of doors and windows. This sensible and inexpensive method of warming and ventilation is worthy of your attention and consideration.

D. H. SMITH

Modern House Heating.

Such detailed descriptions as that of a modern house heating plant in the November issue must be of the greatest value to those who have few opportunities of seeing such plants. I think if you were to give the cost in detail some times it would be appreciated by a large number of your subscribers. W. C.

Letters from Practical Men.

I have been a subscriber and constant reader of your paper since its first issue, and I am well pleased with the letters that appear from heating and ventilating engineers, as I consider them very interesting and instructive. Such articles as the illustrated description of practical working jobs, successfully completed and meeting all the specified requirements, are of great interest to all concerned in the heating and ventilating trade, and in my opinion particularly so to the practical workman. I am a practical steam fitter myself, and I have looked for a long time for a paper whose object it was to publish matter of interest to the trade, and I must say that HEATING AND VENTILATION comes nearer to what is wanted by the practical steam fitter than any other publication of which I know. P. J. DUFF.

Economy in the Use of Fuel.

In the discussion of different devices for the economicl running of steam plants, at the conventions of the various classes of steam users, and in the many trade journals published in their interest, much less attention seems to be paid, and less data collected from which practical deductions can be drawn in regard to coal saving, in plants now in service, and for guidance in the equipment of new ones, than the great importance of the subject certainly should demand. Scientific theories, perhaps, are plenty enough; but the results obtained from actual boiler room work are what are wanted alike by engineers and steam users. If you will throw open your columns to those competent and willing to give such information, a great service will be rendered to your subscribers.

The writer, coming frequently in contact with the owners of steam plants, is often astonished at their almost total ignorance of, and apparent indifference to, the importance of the matters hereinafter referred to and where often so many of their good dollars uselessly go.

It is suggested that the replies to this communication be narrowed down strictly to how to produce the most steam with the least coal, having special reference:

First, To the best sized furnace in relation to the size of the boiler.

Second, Whether the best results are obtained by using stationary or a shaking grate.

It will hardly be disputed that upon these principally depend the economical consumption of coal, taking it for granted that the fireman faithfully and intelligently discharges his duties. A good fireman is the best fuel saver, but he should have good appliances.

It might reasonably be supposed that with the experience of so many years in almost numberless plants, experts would have arrived at some definite conclusion as to what would be the best size furnace for any given size boiler. My experience is, however, that opinions vary considerably, often involving a difference amounting to many square feet of furnace, even when tubes, etc., are the same.

The advocates of shaking or rocking grates very confidently claim that they save fuel in many ways, principally, by cleaning fires from below without breaking up the surface, avoiding waste of coal into the ash-pit, which they contend takes place with stationery grates, where a slice bar is necessarily used and during which process the fire runs down; cleaning fires with closed fire doors, preventing cold air from striking boiler shell; greater air spaces, etc. Other advantages are claimed, but as the above quoted are the ones that more immediately bear upon the question of fuel saving, it is not necessary to refer to them.

The above claims are disputed wholly or in part by those favoring stationary grates. Disinterested opinions from those who have used both are desired.

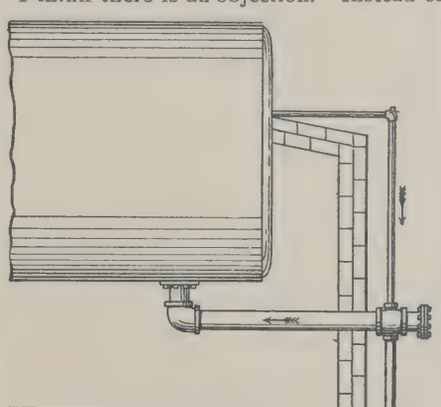
As the object of the writer is not to elicit opinions as to the merits of any particular construction of furnace claimed by any one builder, or as to the merits of any particular grate bar, either stationary or shaking, it is suggested that correspondents restrict themselves in their replies as before indicated, but adding such further information as can be furnished, as to the size of boiler or furnace; whether stationary or shaking bars; consumption of coal in given number of working hours; description of coal, and any comparative details as to results with different sized furnaces and between shaking and stationery grate bars. There are many other matters which might be profitably discussed; such as draught; distance of boilers to top of grate, etc.; but as a number of brief replies, giving broadly general results, are most desirable, other objects may be deferred.

In conclusion the writer believes a free interchange of opinions as indicated, avoiding technical detail, but giving individual experiences, would be appreciated alike, by engineers, superintendents and owners of steam plants. ECONOMY.

Circulation in the Blow-Off Pipe.

"Walter" asks in the November issue if there are any objections to his plan of arranging his blow-off pipe.

I think there is an objection. Instead of



CIRCULATION IN BLOW-OFF PIPE.

being a benefit it would make it worse. Heat acting on water causes it to ascend, consequently, how is the water going to get down through the nipple, as his drawing indicates. I think the heat, acting on the piping, exposed as it is, would have a tendency to expel all the water from the pipe and burn it out in a short time.

I once had a similar trouble and had the piping changed as per enclosed sketch. The boiler has been in constant use for five years, and there has never been a recurrence of the trouble. H. A. S.

Circulating Blow-Off Pipe—Dangerous Pipe Connection.

I believe your columns used for "Letters from Practical Men" to be much needed and surely much appreciated by many practical men, and I heartily concur in the item which appears on page 19 of the November issue referring to the carrying of heating and ventilating questions to extremes.

That circulating blow-off pipe by "Walter" in the November issue is a little bit incomplete. Please have him describe where or how he connects the top end of pipe into the boiler below the water line, especially in a horizontal tubular boiler, as he says. Are we to assume that he connects it into the flue sheet, or head, or into the side sheets? I am not certain that there would be enough difference in temperature in the water between the bottom and top of this pipe to create the circulation he looks for and I should like to have the question made clear.

That dangerous pipe connection by C. J. Larson in the same issue, is about as rocky an affair as I have heard of for some time, yet we have engineers who are averse to license laws and the inspection of boilers and connections, which would unearth many such dangerous makeshifts. The immense heating plant at Fort Riley, Kas., of which I have charge, started up for another seven months' run, heating 71 large residences of 11 and 14 rooms, and barracks and other large structures, with 1174 square feet of heating surface in radiators added to the plant which was described in your September (1893) issue, and 3¼ miles of mains ranging from 5 to 14 inches in diameter, requiring 5 and 7 tubular boilers 5 by 18 feet.

JOHN MUMMERT.

Radiator Connections.

On page 7 of the November number it is recommended that crosses be used on risers when connecting two radiators as described in question No. 120. As the pipe work represents the one-pipe system the condensation from the radiation above will interfere with the circulation of the lower radiation. This is especially noticeable in high buildings piped in this way and is remedied by using large risers and horizontal pipes as there is no advantage in using crosses in this way. Two tees with outlets in opposite directions would answer the purpose or one tee on the riser with close nipple and tee screwed into the opening supplying one radiator from run of the tee and the other from the outlet. Which ever method is used expansion should be provided for by running horizontal pipes to the opposite end of radiators.

The same objections apply to Fig. 2 and answer to question No. 121. If the air valve shown in Fig. 3 was placed on the return near the boiler it would be more serviceable, but it is safe to say that 90 per cent of all heating jobs have no air valves excepting on radiators or risers above the cellar. The connection to the radiator shown in Fig. 3 provides for no expansion and should be run under or behind the radiator to the opposite end. Many fitters have the erroneous idea that a number of close nipples and elbows as shown in Fig. 3 allow the riser to expand without disturbing the radiator. Allowing that all joints are made up with an 18 or 24 inch wrench is it reasonable to expect the expansion of the riser to start a joint before partially raising the radiator from the floor? Any fitter can prove this to his satisfaction by expending the power required to make a joint pressure tight in raising a radiator from the floor using an 18 or 24 inch wrench as a lever. The expansion of risers is generally expended by "springing" the horizontal pipes or partially raising the radiators and very seldom by starting a joint.

Check valves, when used as shown in Fig. 4 on low pressure heating work, are a source of continual annoyance, for if the return pipe on which the check valve is placed has a "pitch" toward the return or is unseated in any way steam will back up the return and the radiator will not circulate properly. If part of a system is one pipe, there is no reason for taking a return from any radiator or coil. If dry steam is delivered to a radiatior and pipes are of ample size and properly graded, it will work as well "one-pipe" without a return as with it. A radiator that is too large for "one-pipe" is too large for "two pipe."

The overhead system shown in Fig. 5 and 6 could be improved by taking steam from the side or top of the main instead of the bottom as shown, connecting tees where necessary to relieve the main of condensation, and carrying the relief pipes direct to the main return in the cellar.

As opinions differ on such subjects, it is a source of useful information to interested fitters to know the methods employed by others to obtain desired results.—FITTER.

NEWS AND NOTES.

New York City

Plans are completed for the erection of a new hospital on Central Park West, between 92d and 93d streets, at a cost of $1,400,000; Charles C. Haight, architect. The Foreign and Home Missions Board of the Presbyterian Church will erect a home on the corner of 20th street and Fifth avenue, at a cost of $1,000,000. Andrew J. Kerwin will erect six 5-story flats on 103d street, south of Manhattan avenue, at a cost of $180,000; A. B. Ogden & Sons, architects. John Yule, 140 Manhattan avenue, will erect four 5-story flats on 102d street, at a cost of $680 00. William Fernschild, 1026 Westchester avenue, will erect five 4-story flats on the corner of 163d street and Melrose avenue, at a cost of $65,000.

Nicholas Cotter, 264 Main street, Stamford, Conn., will erect two 5-story flats on the corner of Brook avenue and 147th street, at a cost of $60,000; J. C. Burns, architect. Michael J. Keenan, 233 West 142d street, will erect two 5-story brownstone dwellings at 227 and 229 West 142d street, at a cost of $44,000; Benjamin F. Lowe, architect. Marion E. Moore, West New Brighton, S. I., will erect two 5-story brick flats on 147th street, near Seventh avenue, at a cost of $36,000. James McLaughlin, 140 West 67th street, will erect two 5-story brick flats on the south side of 101st street, east of Amsterdam avenue, at a cost of $36,000. Messrs. Hawk & Wetherbee, proprietors of the Windsor Hotel, will erect a fine hotel on Madison avenue and 42 street; Henry J. Hardenberg, architect. The Y. M. C. A. of 74 West 124th street, will soon erect a new hall in Harlem. Louis Haberstroh will erect a 2-story dwelling on Eleventh avenue, corner of 188th street, at a cost of $16,000; Herman Horenburger, architect.

Albert C. Morris, 1666 Amsterdam avenue, will erect three 5-story flats on 145th street, west of Amsterdam avenue at a cost of $105,000. Furman V. Gaines, 133 West 97th street, will erect three 5-story brick tenements on St. Nicholas avenue, north of 119th street, at a cost of $55,000. John W. Livingston, 103 East 86th street, will erect two 5-story brick flats on the south side of 88th street, west of Madison avenue, at a cost of $60,000. A. H. Jackson, 53 East 67th street, will erect a 7-story brick warehouse at 154 East 23d street, at a cost of $50,000 W. W. Gallagher will erect a 5-story brick dwelling on 31st street, east of Second avenue, at a cost of $20,000. Joseph Hitzel, 349 East 156th street, will erect three 3-story tenements on the corner of 156th street and Courtlandt avenue, at a cost of $15,000.

Sol. Sayles will erect a 6-story brick building at 126 and 130 Sixth avenue, at a cost of $80,000. Messrs. Wiederman & Rosenbaum, 18 East 115th street, will erect two 5-story brick flats at 221 and 223 West 16th street, at a cost of $46,000; also one 5-story brick flat at 225 West 16th street, at a cost of $23 000. Ida L. and Mary E. Jenkins will erect a 5-story brick flat on the corner of 117th street and Morningside avenue, at a cost of $25,000. Frederick Aldhouse will erect five 4-story brick dwellings on 87th street, east of Columbus avenue, at a cost of $125 000.

Thomas McManus, 124 East 72d street, will erect five 4-story brick flats on Fifth avenue, near 14th street, at a cost of $138,000. August Trenkemann, 241 Center street will erect a 7-story brick factory on the corner of Center and Broome streets, at a cost of $45,000; Messrs. De Lemos & Cordes, architects. N. Le Brun & Sons are the architects for a 3 story brownstone front fire engine house which will be erected on the corner of Elm and White streets, at a cost of $80,000. Gertrude R. Waldo, Savoy Hotel, will erect a 5-story brick dwelling on 72d street, east of Madison avenue, at a cost of $18,000. She will also erect another on the corner of Madison avenue and 72d street, at a cost of $65 000; Messrs Kimball & Thompson, architects.

James S. Barry, 2498 Valentine avenue, will erect two 4 story brick flats on Brook avenue, south of 135th street, at cost of $32,000. Frederick Hack, 227 Lenox avenue, will erect two 5-story brick flats on 105th street, west of Amsterdam avenue, at a cost of $4 0,000. Charles Fleischman will erect a 3-story brick building on 139th street, east of Alexander avenue, at a cost of $15,000; Theodore G. Stein, architect. Peter Cooper will erect a 2-story brick building at 102 and 106 East 28th street, at a cost of $20,000.

William F. Lennon, 21 West 93d street, will erect four 5-story brick flats on Orchard street, west of Rivington, at a cost of $100 000. He will also erect six 5-story brick flats on the east side of Allen street, at a cost of $150,000. Mary Eichler, 168th street and Fulton avenue, will erect two 4 story brick flats on the east side of Vanderbilt avenue, north of 168th street, at a cost of $40,000. Siegfried Willershausen will erect four 5-story brownstone dwellings on the south side of 90th street, east of Amsterdam avenue, at a cost of $100,000. St. Cecilia's Church has filed plans for the erection of a 5-story brick parochial school building on 106th street, east of Third avenue, at a cost of $60,000.

Schreiner & Fennel will erect five 5-story brick dwellings on the south side of 90th street, east of Second avenue, at a cost of $88,000, and will also erect four 5-story brick flats on the southeast corner of Second avenue and 90th street, to cost $75,000. William H. Ramsay will erect a 5-story brownstone front dwelling on the north side of 77th street, west of Amsterdam avenue, at a cost of $21,000. Mary A. Savre has filed plans for the erection of two 5 story flat houses on the east side of Amsterdam avenue, north of Manhattan street, at a cost of $30,000. Charles G. Judson has filed plans for the erection of four 5-story brick dwellings on the corner of Amsterdam avenue and 143d street, at a cost of $60,000, and also for the erection of a 5-story flat on the north side of 143d street, east of Amsterdam avenue, at a cost of $30,000.

P. J. Carlin & Co. have been awarded the contract for erecting public schools at Cornelia street and Hamburg avneue, and at Eighth avenue and 13th street, by the Schoolhouse Committee of the Board of Education, the former to cost $75,250 and the latter $74,741. Peter Y. Kyle, 258 17th street, Brooklyn, will erect three 5-story brick flats on the south side of 70th street, east of First avenue, at a cost of $57,000; John H. Knuebel, architect. The Society of the Free Church of St. Mary the Virgin will erect four buildings in one group on the north side of West 46th street, west of Sixth avenue, and on the south side of West 47th street, west of Sixth avenue, at a cost of $800,000; N. Le Brun & Sons, architects. Frederick Brandt, 538 East 84th street, will erect three 5-story brick flats on the south side of 100th street, west of Second avenue, at a cost of $54,000.

Plans are nearly completed for the erection of the new Columbia College buildings on Riverside Heights, at 160th street. David Christie will erect a 5-story brick flat on Amsterdam avenue, north of 101st street at a cost of $16,000. W. J. Phelan will erect a 5-story brick parochial school on the south side of 106th street, east of Third avenue, at a cost of $6,(00. Anne Van Nest Gambrill will erect a 5-story brick dwelling on the west side of Park avenue, north of 35th street, at a cost of $45,000. Jacob Jung and Jacob Mohl, 213 East 89th street, will erect five 5-story brownstone front dwellings at 15, 17, 19, 21 and 23 West 98th street, west of Eighth avenue, at a cost of $100,000; Charles Stegmayer, architect.

Henry F. Cook, 264 Columbus avenue, will erect two 4-story dwellings on the north side of 165th street, east of Forest avenue, at a cost of $55,000; Henry F. Cook, architect. John D. Allen, Philadelphia, has completed plans for a new theatre to be erected by Messrs. Canary & Lederer, on 42d street and Seventh avenue, at a cost of $400,000. Ground will soon be broken for the erection of the new edifice of the St. Paul's M. E. Church at West End avenue and 86th street, at a cost of about $200,000. Plans have been filed for the erection of a 5-story brick house on the south side of 104th street, west of Park avenue, by Edward C. Thatcher, at a cost of $20,000. James E. Farley has filed plans for the building of a 7-story flat house on the southeast corner of Columbus avenue and 77th street, at a cost of $20,000.

John B. Ireland has filed plans for the erection of a 7-story brick factory on the corner of South Fifth avenue and West 3d street at a cost of $85,000. H. & H. Schmidt has filed plans for the erection of two 5-story brick flats on the south side of 94th street, west of Park avenue, at a cost of $56,000. Plans have been filed by Randolph Guggenheimer for the erection of four 12-story brick buildings in East Washington Place, at a cost of $164,000. Samuel Cosu has filed plans for the building of an 8-story brick building at 91 and 93 Fifth avenue, at a cost of $165,000. Frederick M. Sauer, Conrad R. Gross and George Herbner have filed plans for the erection of twelve 5-story dwellings on the south side of 91st street, east of Amsterdam avenue, at a cost of $264,000.

Plans are being drawn for the erection of a new building for the Y. M. C. A. It will be erected in 56th and 57th streets, between Eighth and Ninth avenues, at a cost of $500,000. George Schreiner, 109 West 121st street, will erect three 5 story brick flats on the north side of 33d street, east of Second avenue, at a cost of $75,000; John Hauser, architect. George G. Banzer, 1712 East End avenue, will erect two 5-story brick flats on the north side of 69th street, east of First avenue, at a cost of $36,000; Edward Wenz, architect. Harry Chaffee, Boulevard and 66th street, will erect a 7-story brick hotel on the west side of Sherman Square, south of 71st street, at a cost of $80,000. The New York Board of Fire Underwriters will erect a 4-story brick patrol house at 240 West 30th street, at a cost of $20,200. Wm. Lefridge, 252 West 53d street, will erect a 5-story dwelling on the east side of Columbus avenue, south of 118th street, at a cost of $20,000; G. F. Pelham, architect.

Philadelphia.

The contract has been awarded William H. Yelland for building an extensive plant for the Citizens' Ice and Refrigerator Co., at Paul and Meadow streets, Frankford; Messrs Stearne & Coster, architects. Lynch & Wagner are about to erect four residences on the east side of Broad street, south of Clearfield. Plans have been prepared for the handsome residence of C. J. Miller, to be erected at 15th street and Allegheny avenue, by Judson M. Zane. James B. Carey, 3806 North Broad street, will erect twelve 2-story brick homes on the north side of Auburn street, east of Amber. Eden M. E. Church, Lehigh avenue and Lawrence street, are erecting a new edifice, which will cost $30,000. John Airy is soon to commence an extensive building operation in West Philadelphia. He is to erect five large 3-story dwellings on 48th street, south of Westminster avenue. Louis Paul will shortly erect fifteen 2-story houses on 25th street, between York and Hogert streets. James L. Stevenson, Ridge avenue and Diamond street, will erect ten 3-story brick and stone dwellings on the north side of Arlington street, west of 32d.

William Rhodes, who purchased the old car depot of the 17th and 19th street lines, will soon begin a big building operation on the ground. He will erect 3-story houses, which will cost about $9,000 each. Mr. Rhodes also intends to erect other buildings on the ground bounded by 19th, 20th and Cumberland streets, and on this property 155 2-story houses will be erected. John Crawford will erect twenty-four 2-story dwellings on Carlisle street, south of Wolfe. Plans are being made for a big hotel to be erected on the site of the Empire Theatre, on the corner of Broad and Locust streets, by Angus Wade; it will cost about $2,000,000. Messrs. Leonard & Brennan will erect eighteen 2-story houses on the west side of Carlisle street, west of Jackson. Ground has been broken by Contractor J. Irving Taylor for the erection of eight houses at 12th and Walnut streets, Chester, Pa., for John Wilson. New fire-proof apartment houses are in course of erection at the intersection of Broad street, Fairmount avenue and Ridge avenue; Willis G. Hale, architect; the building will be heated by steam.

Ground has been broken at 23d street and Lehigh avenue for the erection of a new Catholic Church for the North Penn village section of the 28th Ward, at a cost of $20,000. William F. Albrecht will erect 14 houses on the north side of Showaker street, west of 25th. Wilfred Hipple will erect 25 houses on 13th street, north of Susquehanna avenue. Architect Frederick S. Newman will erect a mangificent structure on the southeast corner of Parkside avenue and 42d street, at a cost of $30,000. The German congregation, which has been worshipping in Welcome Hall, on Frankford avenue, will build itself a new church on the south side of Montgomery avenue, east of Frankford avenue; William Steele & Son, 506 Walnut street, are the contractors. McIlvain, Strong & Co., will erect seven 2-story brick and stone dwellings on Clarion street, east side of the 25th ward.

Wendell & Smith, Germantown, will erect two 3-story brick and stone dwellings on the southeast side of Phil-Ellena street. Drawings are being received for the erection of the new War Library and Museum, to be erected at Broad and Vine streets by the Loyal Legion. The Augusta apartment house will soon be under way. The site is at 16th and Spruce streets; Willis G. Hale, architect. Bids are being received by Messrs. Schemmerhorn & Reinhold for the erection of a handsome hotel in the City of Mexico. Plans are being prepared for the erection of a new schoolhouse in Camden by Architects Moses & King. Frank D. Zell will erect 15 houses at 42d street and Mantua avenue. John Devlin will erect 112 2-story houses in the lower section of the city, around 26th street, between Dickinson and Tasker streets. Permit has been granted Builder Sharp for the erection of six 3-story houses on Montgomery avenue, west of 22d street, and six 2-story houses on Croskey street, north of Montgomery avenue. Plans have been accepted for the erection of two public schools, one on the corner of 27th and Wharton streets, and the other on the corner of Ridge avenue and Levering street. Permit was granted Wm. A Arthur & Bro. for the erection of twelve 2-story dwellings on the north side of Jefferson street, east of 56th street, and for six 3-story buildings on Lansdowne avenue, east of Conestoga street.

Chicago and the West.

Chicago.—Plans have been prepared for the Dell apartment building on Boulevard Place, between Vincennes and St. Lawrence avenues, at a cost of $20,000; J. T. Nicholson & Son, architects. Lincoln Brooke will erect a 5-story apartment house on the west side of Wabash avenue, south of 36th street, at a cost of $60,000; it will be heated by steam; Robert Rae, Jr., architect. Plans have been designed for the erection of an 8-story and basement building for George C. Newbury, on the corner of Wabash avenue and Eldridge Court, at a cost of $100,000; the George A. Fuller Co. are the contractors. Max Morganthau, Max Frank and H. Stern are to erect three handsome residences on Drexel boulevard, at a cost of $25,000 each; they will be heated by steam; H. R. Wilson, architect.

H. R. Wilson, architect, has designed for himself a very handsome 3-story residence at 4340 Grand Boulevard, at a cost of $20,000; it will be heated by steam. J. P. Gardner will erect a 6-story store and factory on the corner of Wells and Illinois streets, at a cost of $35,000; Messrs. Pond & Pond, architects. Brainerd & Holsman have designed a conservatory of music to be erected in Lincoln, Neb., in connection with the State University; it will be a 4-story building and cost $45,000. Permit has been granted M. W. Ryan for the erection of three 4-story flat buildings at 718 and 720 South Canal street, to cost $32,000. Plans are being prepared by Architect Fiedler for the Board of Education for the erection of a large addition to the Duncan avenue school building, at a cost of $50.000.

The Historic Vienna Co. will erect a new building in North Clark street, opposite the Newberry Library, at a cost of $175.000. A. Murray will erect ten flat buildings on Hoffman avenue, near Franklin street, at a cost of $40,000; Ernest C. Holmboe, architect. Swift & Hall are taking figures for the erection of three 3-story residences to be built on Prairie avenue, between 42d and 43d streets, at a cost of $20,000. Theo. A. Kochs will erect an apartment building on Locust street, near La Salle avenue, at a cost of $15,000; it will be heated by steam. J. J. Dunn will erect a 4-story apartment house at 5052 and 5054 State street, at a cost of $35,000; it will be heated by steam; Messrs. Beers, Clay & Dutton, architects.

Kleinpell & Borst have designed for E. J. White and I. M. Bennett two 3-story houses to be erected on Woodlawn avenue, between 46th and 47th streets, at a cost of $16,000; they will be heated by steam. W. C. Foley will erect four houses on Vincennes avenue, between 41st and 42d streets, at a cost of $18,000; they will be heated by steam; Messrs. Kleinpell & Borst, architects. J. Birk will erect a 6-story building on the west side of Desplaines street, near Congress, at a cost of $100,000; Messrs. Huehl & Schmid, architects. D. S. Place will erect an 8-story warehouse at 111 and 113 West Harrison street, at a cost of $40,000. The Durand-Kasper Co. will construct a 6-story warehouse at 163 to 167 Lake street, at a cost of $80,000. Potter Palmer has planned the construction of six fine residences at the corner of Pine and Chestnut streets, and three more houses on Goethe street, near the Lake Shore drive, at an average cost of $20,000.

Patten & Fisher have designed a new apartment house on the corner of Cottage Grove avenue and 46th street, for P. L. Underwood, at a cost of $60,000. Contract has been awarded Morris Beifeld for the construction of an apartment building on the corner of Van Buren and Sangamon streets, for Rhorer Bros., at a cost of $150,000; it will be heated by steam. Julius Zittel has prepared plans for an apartment building to be erected on the South Side; it will be 8 stories and have an electric plant, and heated by steam, at a cost of $80,000. The Chicago Bible Society are having plans perpared for the erection of a new Bible house in the business district of the city. Fritz Lang is preparing plans for a handsome double apartment building on Prairie avenue, near 47th street, at a cost

of $2,5000. Carl Neilson has completed plans for the erection of an apartment building at the corner of Humboldt boulevard and Armitage avenue, for Albert Tisher, at a cost of $15,000. W. Hill will erect four 2-story houses on Oglesby avenue, near 61st street, at a cost of $18,000; J. C. Llewellyn, architect. William L. Newman has prepared plans for the erection of an apartment building on Madison avenue, near 73d street, for C. F. Gardner, at a cost of $15,000.

Ernest Mayo has prepared plans for a store and office building on the corner of South Chicago and Exchange avenues, South Chicago, for James A. Murphy, at a cost of $35,000. The new building of Nasmer & Fenn will soon be erected; it will be heated by steam and contain all the other improvments, at a cost of $250,000. G. A. Flavelle will erect a handsome apartment house on Orchard street, north of Wrightwood avenue, at a cost of $38,000; Handy & Cady, architects. Permit has been granted George Franks for the erection of five 2-story houses at 1927 and 1933 Deming court, at a cost of $35,000. Plans have been designed for the erection of a home for the Evangelical Orphans and Old People's Home Association at Bensonville, at a cost of $20,000; Fred Alschlager, architect. Plans have been designed by Henry P. Harned for the erection of an apartment house on the southwest corner of Grand boulevard and 47th street, for R. S. Peale, at a cost of $65,000.

Stephen G. Griffin will erect a 3-story apartment building at the corner of Flournoy street and Western avenue, at a cost of $30,000; George H. Gussing, architect. C. E. Follansbee will construct a 4-story flat building at the corner of State and 23d streets, at a cost of $60,000; it will be heated by steam, and was designed by William T. Lesher. Mrs. Minnie Mohnke will erect a 3-story building at 4227 and 4229 Calumet avenue, steam heat, at a cost of $25,000; Perley Hale, architect. Plans have been prepared for the erection of a 3-story apartment house on Langley avenue, between 37th and 38th streets, at a cost of $20,000; Alfred Smith, architect. Plans have been prepared by S. N. Crowen for the erection of a 4-story apartment house at 494 to 500 Belden avenue, at a cost of $42,000; O. Benson, owner.

Hosmer & Fenn have taken out a permit for the construction of the Ringgold, at the northwest corner of Twenty-second street and Indiana avenue, at a cost of $100,000. Henry Ives Cobb is the architect. Frank L. Bennett has taken out permit for the construction of six two-story and basement houses at 506 to 530 Fifty-third street, at a cost of $30,000. August Westberg has prepared plans for a three-story and basement apartment building at 6446 and 6448 Harvard street for F. P. Barkey, at a cost of $26,000. He has also prepared plans for a three-story and basement apartment building at 5430 Lexington avenue for Yrebilcock & Penhallegon, at a cost of $23,000. Charles F. Sorensen is preparing plans for a modern residence on Pine Grove avenue, near Grace avenue, for J. A. Miller. It will be two-stories, with attic and basement, and will cost $11,000. Hot water heating will be used.

St. Louis, Mo.—G. T. Burdeau will erect three dwellings on McPherson avenue, between Sarah street and Vandeventer avenue, at a cost of $15,000. Samuel Bowman will erect a 5-story brick dwelling on Franklin avenue, between 11th and 12th streets, at a cost of $40,000. Permit was granted W. A. Swazey to erect a dwelling on Westminster place, between Boyle and Newstead, at a cost of $15,000. Permit was granted the Central Security Association to erect four adjoining buildings on Cook street, between Grand and Vandeventer streets, at a cost of $15,000. B. Weber & Son have been awarded the contract of the new Drummond factory, at a cost of $81,000. The Valley National Realty Co. have awarded the contract to erect a handsome building in Portland place to Bothe & Rottermann, at a cost of $40,000. A 12-story building will soon be erected on the corner of 7th and Pine streets, at a cost of $1,000,000. A number of flats will be erected by J. J. Hedrick, near Vandeventer and Warne avenues, to cost $15,000. Permit was granted Norman Brown for the erection of three 2-story dwellings on West Cabanne, Hamilton and West Cabanne court, at a cost of $16,500. The congregation of the English Evangelical Lutheran Church of the Holy Trinity contemplate the erection of a new edifice, to cost over 20,000.

Milwaukee, Wis—The Zion's Lutheran congregation will erect a new church at once, on 25th street. Steam will probably be used to heat the city Isolation Hospital No. 2 this winter, instead of stoves. Plans have been prepared by Architects Van Ryn & Lesser to erect a 4-story brick block of flats at 525 Milwaukee street, by Dr. J. Cavaney. The Green Bay Odd Fellows will erect a theatre in connection with a lodge hall very soon, at a cost of $30,000. E. E. Joralemon is preparing plans for the erection of a big apartment building in the vicinity of the public library building. Harry W. Jones has designed for the erection of a large 3-story flat on the corner of 16th street and Nicollet avenue, by Valentine Bros., at a cost of about $30,000.

Duluth, Minn.—The contract for the erection of a handsome 5-story brick business block on part of the old Hotel St. Louis site, has been awarded to Butler Bros., of St. Paul, at a cost of $88,000.

Louisville, Ky.—The congregation of St. Paul's Episcopal Church will erect a 2-story brick church on the corner of Fourth and Victoria Place, at a cost of $50,000.

Pontiac, Mich.—The corporate body of the Free and Accepted Masons, of Pontiac, will soon erect a new temple in this city at a cost of $25,000.

San Francisco, Cal.—T. J. Welsh has prepared plans for the erection of a new schoolhouse on the Portrero. He has also prepared plans for the erection of the girl's high school on Collingwood street, in the Eureka valley. The contract has been awarded to S. R. Doyle.

Cleveland, O.—A very large building will be erected on the old Ursuline convent property on Euclid avenue, at a cost of $500,000. The Olivet Congregational Church will erect a new church on Wade avenue, between Madison and Giddings avenues..

OUR QUERY BOX.

In this department questions on topics of general interest relative to the heating and ventilating of buildings will be carefully considered and answered by competent heating and ventilating engineers. Correspondents must send their real name and address, not for publication, but as a guarantee of good faith.

Setting a Boiler.—Q. What amount of space should be left between the back end of a boiler and the wall? The boiler is 36 inches in diameter, with thirty 3-inch tubes. Which gives the best results, to fill up back of the bridge wall under a boiler, or to leave the space open back to rear wall; and how far should the top of a bridge wall be from the bottom of the boiler? Which is the correct way to feed and blow off a stationary boiler, at the front or back end?

A. There should be between 20 and 24 inches between the boiler and the back wall. We do not know that it would make any difference practically whether the space back of the bridge wall was filled in or not, although it is more easily cleaned by being inclined off from the bridge of the back wall. The purpose of the bridge wall is simply to hold the coal upon the grate. It makes no difference what the distance is between the top of the wall and the boiler; simply fill it high enough to fill its purpose. It is much better to feed and blow off at the back than at the front end.

Wetting Soft Coal.—Q. Is there any advantage in wetting soft coal?

A. There is a practical advantage in wetting soft coal in that it prevents the immediate flashing of the coal upon firing, makes it coke better, and prevents so much of it escaping through the grates unburnt.

Bursting Pressure of a Boiler.—Q. Will you please give me the bursting pressure of a boiler 42 inches in diameter, .26 of an inch in thickness, and 70,000 pounds tensile strength?

A. Multiply the thickness by the tensile strength, and divide by the radius, which will give you 866.66 pounds as the bursting strain.

Removing Pump Valve Seats.—Q. Will you please tell me the best way to remove brass valve seats in the water end of a Blake steam pump, and to replace them with new ones?

A. Drive an eye-bolt into the center of the seat, and pull the seat away by the means of a wrench or bar through the eye. Then drive the new seats into place.

Soot in Chimneys.—Q. What is the best means to resort to in order to keep the soot from taking fire in a stack? I have been troubled lately by the soot taking fire, and the sparks have been the cause of a number of small fires. I have thought of placing a screen over the stack, but that will check the draft. We use bituminous coal, which forms a great deal of soot.

A. So long as soot is allowed to accumulate in the chimney it is liable to take fire, especially if there is a chance for the admission of air. The only remedy which we can recommend is to prevent the accumulation of soot or to take some means to remove it after it has accumulated. Try to improve your combustion so as not to make so much soot, and by means of a blower or steam jet clear the stack out occasionally. We do not think that a screen of coarse mesh would be any practical obstruction to the draft.

Injectors and Inspirators.—Q. Will you please inform me whether or not an injector or inspirator is the same thing, and if not, what is the difference?

A. Yes; an inspirator is the same as an injector, inspirator being simply the name adopted by the Hancock Inspirator Co. for the injector which they manufacture.

Position of Safety Valves.—Q. On a horizontal tubular boiler there are two safety valves, both set to blow off at the same pressure. One is two feet above the other. Which one will blow off first?

A. There will be no appreciable difference from any difference in the steam pressure.

Live Steam Heaters.—Q. Is there any advantage in using live steam to heat feed-water? We have a feed-water heater here built the same as an exhaust heater, but designed to use live steam, which has never been connected up, and I can see no advantage in its use. The water of condensation is returned to the boiler by a pump.

A. There appears to be a slight advantage in using live steam to heat feed-water. Exactly why this is so is not apparent. It is also a matter of frequent observation that the saving resulting from the application of an ordinary exhaust heater exceeds in percentage that which can be theoretically deduced from the number of heat units added to the feed water. None of the speculations as to the cause of these facts are entirely satisfactory. Perhaps that which attributes the increase in efficiency to the better circulation resulting from the hotter feed is most so. At all events it is a subject which will bear investigation and discussion.

Boilers for Heating.—Q. How many horse-power in a boiler will it take to heat a thousand feet of heating surface, and will you give me a rule for figuring it?

A. One square foot of heating surface in the boiler is capable of supplying steam for from seven to ten square feet of radiating surface, for heating purposes.

Bags on Boilers.—Q. Will you please inform me what causes bags on boilers?

A. Bags are caused by the sheet becoming overheated and being forced outward by the pressure. Any accumulation upon the inside of the sheet, which will prevent the free access of the water to the heating surface, will result in bagging.

Cubic Capacities.—Q. Will you please give me a rule for finding the quantity of liquid that may be contained in a tank at different heights?

A. For a round tank, multiply the square of the diameter by .7854 and by the depth of the liquid, all in inches. Divide by 231, which is the number of cubic inches in the gallon, and the quotient will be the number of gallons in a tank.

Cleaning Injectors.—Q. Will you please tell me what is the best solution for cleaning injectors?

A. For cleaning injectors, where the jets have become scaled, use a solution of one part muriatic acid to from nine to twelve parts of water. Allow the tubes to remain in the acid until the scale is dissolved or is so soft as to wash out readily. Do not use the shank of a file or other scraper, as the efficient working of the injector depends materially upon the size of the jet, which should be left as the manufacturer makes it.

Stowing Coal.—Q. Will you please let me know what space is required to stow a ton of hard coal and oblige?

A. The space required depends to some extent upon the size of the coal, but upon an average 41.25 cubic feet.

Cost of Boilers.—Q. What is the average selling price of a horizontal tubular boiler with fittings?

A. From $9 to $15 per horse-power, the highest price on the smaller sizes, the lower price on boilers of 100 horse-power and upwards, including fronts, grates, doors, valves and fittings.

Heating Service.—Q. Will you please inform me how many square feet of heating surface is required to evaporate 30 pounds of water per hour in best present practice with horizontal tubular boilers, set in brick and fired underneath?

A. From 12 to 15 square feet, with ordinary natural draft under moderate running conditions.

Horse Power of Boilers.—Q. Will you please tell me how to find the horse-power of a steam boiler?

A. The horse-power of a steam boiler depends upon its capacity for evaporating water into steam. The evaporation of 30 pounds of water per hour from a feed water of 100 degrees into steam of 70 pounds of pressure constitutes one horse-power, and the hourly evaporation of the boiler reduced to an equivalent of these conditions and divided by 30 will give the horse-power. If the evaporation cannot be determined, an approximation to the capacity of the boiler in horse power may be made from the square feet of heating surface. Water-tube boilers requiring from 10 to 12 square feet of heating surface per horse-power, tubular boilers from 12 to 15, flue boilers from 8 to 12, plain cylinder boilers from 6 to 10, locomotive boilers from 12 to 16.

Capacity of Injectors.—Q. Where, if at all, can I get an injector that will feed water from a Stillwell open heater at about 198 degrees F., with 80 pounds of pressure?

A. We have no knowledge of an injector which would be equal to that duty.

Steam Heating Books.—Q. Will you please give the names and prices of some reliable works on steam heating?

A. "Steam Heating for Buildings," by Baldwin, $2.50; "Steam Heating" by Robert Briggs, Van Nostrand's Science Series, 50 cents; "Practical Treatise on the Warming of Buildings by Hot Air and Steam," by Ford (English) $5; "Steam Heating Problems from the Sanitary Engineer," $3; "Essays on Heating," from the Metal Worker, price $2.50. "Hood on Warming Buildings," by F. Dye, price $6; "Hot Water Heating and Fitting," by Baldwin, price $4. Mills' "Heat Studies" (see advertisement, page viii). Any of these works can be furnished at this office, post-paid, upon receipt of price.

Pressure and Temperature of Steam.—Q. Will you please give me a formula for determining the temperature of steam when the pressure is known?

A. Among the earliest and most simple formulæ was that of Tredgold, $p = \left(\frac{a + t}{b}\right) n$, where a, b and n, are constants determined by comparison with the table. Tredgold used $a = 100$, $b = 177$, and $n = 6$, for Fahrenheit degrees and inches of mercury. A far more exact representation of the law connecting the elastic forces of steam with its atmosphere is obtained by expressing not p itself, but the logarithm of p in terms of the temperature. As an example of this formula we may instance that used by Tate (Fairbairn's Millwork, Part I, p. 201) $\log. p = 5 \frac{t - 212}{t + 367}$, where p is given in atmospheres of 14.7 pounds per square inch. Rankine's formula, proposed partially on theoretical grounds, is $\log. p = A - \frac{B}{T} - \frac{C}{T^2}$ where T is the absolute temperature and A, B and C are constants, the values of which, as employed by Rankine, are as follows: $A = 6.1007$, $\log. B = 3.46642$, $\log. C = 5.59873$; in which it is to be noted that the pressure is supposed in pounds per square inch above absolute zero, and the temperature must be reckoned from a zero 461.2 degrees below the zero of Fahrenheit scale. One of the simplest formulas, which gives results closely agreeing with the observed relations of M. Regnault, is that arranged by W. M. Buchanan, as follows: $t = \frac{2938.16}{6.1993544 - \log. p} - 371.85$, in which p is the pressure in pounds per square inch above absolute zero and t is the temperature of saturated steam in degrees Fahrenheit. Example: What is the temperature of steam of 60 pounds absolute (about 45 pounds gauge)?

The logarithm of 60 (from table) is 1.7781513, then

$$t = \frac{2938.16}{6.1993544 - 1.7781513} - 371.85 =$$

$$\frac{2938.16}{42.212031} - 371.85 = 664.56 - 371.85 = 292.7°. \text{ Ans.}$$

TRADE NOTES.

James P. Marsh & Co. 226 Washington street, Chicago, Ill., have just brought out a new air voalve for steam radiators, and have received orders for 1,000 to be used in the new Marquette building 250 for the Kent apartment building, and 300 for the American Press Building, all of Chicago.

The business of T. C. Joy & Co., 82 Lake street, Chicago, will hereafter be conducted under the management of Mr. William H. Harrell, formerly of the Harrell Radiator Co., of Dunkirk, N. Y. Mr. Harrell is an accomplished engineer, a master steam fitter, and has a thorough knowledge of radiator manufacture. He is, moreover, an affable gentleman who will no doubt be favorably received by the Chicago trade.

The Exeter Radiators made by the Exeter Machine Works, Exeter, N. H., and Boston, Mass., are being used in the following buildings: block at St. Johnsbury Vt., by A. B. Noyes & Co., St. Johnsbury; block at Tilton, N. H., by E. H. Randall & Co., Concord, N. H.; church at Pontiac, R. I., and schoolhouse at Oaklawn, R.I., by the Capital Heating Co., of Providence; two schoolhouses at Woonsocket, by C. W. Talcott and J. F. Mulvey, Woonsocket, R. I.; the New Odd Fellows' Block, Somersworth, N. H.; Somersworth Hotel, Somersworth, N. H., and a schoolhouse at Saco, Me., by Williard E. Paul, Portsmouth, N. H.

The Herendeen Mfg. Co., Geneva, N. Y., send us the 57th edition of their catalogue, price list and list of references. A new cut of exquisite and exceedingly tasteful design, representing a winter scene outside and the comfort derived from a Furman heater within, is used as a front piece. The many neat initial letters which have appeared in their other catalogues, issued this year, are still used with good effect. An article on modern hot water heating and another giving the characteristic feature of this system are very interesting. The book is profusely illustrated with cuts showing the good points of the specialties manufactured by this company. They have many splendid testimonials and every facility of ordering goods is made plain for the use of fitters. The outside back cover contains only the new monogram adopted by the company.

The St. Louis Radiator Mfg. Co., 605 Union Trust Building, St. Louis, Mo., report a business of over 10,000 feet of radiation for the month of October. They have received many orders from Iowa, Nebraska, Kansas and Texas, and locally have secured about all the contracts let. The character of the buildings using these radiators attests the growing popularity of this enterprising firm. They point with justifiable pride to the buildings in which the radiators have been used, a few of which are mentioned below: Terminal, Dormitzer, Van Studdford, Forest Park and Summit hotels, Chicago; Price hotel, Glasgow, Mo.; Patterson, Lenderman, Adams Express Co., Krote and Peter Hauptman Tobacco Co. buildings, Finney avenue flats and stores, Spaulding Club, Alton, Ill., St. Joseph Orphan Aslyum, Hodgen school, Chas. Lewis shoe factory, Belleville, Ill., Ralston flats and stores.

How to warm our houses in the most efficient and economical manner is the study of all persons of limited means who prefer to keep house rather than board. It is the important question of housekeeping. The Wilkes hot water heater is constructed on vertical lines for water movement, a cone shaped innerlining, in combination with the inside straight shell, is the form, thus giving the fullest effect to the action of the fire to the top of the boiler. For more than twenty years this heater has been in use, first made in smaller sizes for kitchen, bath house and conservatory work. On account of the general satisfaction which it gave it was made in larger sizes, and has been placed in public buildings, hotels, residences, and many have been purchased by the United States Government. The prices are reasonable, and the Wilkes Mfg. Co., 123 South Clinton street, Chicago, will be glad to send catalogue upon application, mentioning HEATING AND VENTILATION.

The Union Stove Works, 70 Beekman street, New York, have favored us with sectons 1 and 2 of their new catalogue for 1894-1895, just out. The new catalogue is to be issued in six sections covering the r full line of goods. Section 1 shows an extensive line of cook stoves and portable cooking ranges of all grades, in all possible varieties, and with all possible improvements, plain, with low closets, with reservioirs, with high shelves and with water backs. This line is unsurpassed in beauty, design or finish. Section 2 shows an extensive line of water back ranges, Franklin heaters, fireplace heaters, hot air furnaces, etc. Their new patent gas stove attachment, which was put on the market for the first time this year, is adjustable to all their leading sizes. Special attention is called to the Astor Nos. 2 and 3, with rivetless horizontal boiler and gas stove attachment, made to meet the requirements of small families, being especially adapted for apartment houses. It is furnished with a Reed's patent damper foot opener for the oven door, oscillating oven shelf, tin-lined door, and nickel knobs. The company use only the new patent rivetless horizontal boiler, which is especially made to their order and is so arranged that it can be emptied and the sediment thoroughly cleaned out without removing the boiler, which they claim cannot be said of any other horizontal boiler made. The fittings of the circulating pipes of these boilers are cast from the company's own patterns and are made of galvanized malleable iron. No lengthening nipples are used, and it is claimed that there are eight less joints in the water pipes of these ranges than in any other range on the market. The company manufacture a fine line of furnaces, and will send their catalogues upon application, mentioning HEATING AND VENTILATION.

The Peck-Williamson Heating & Ventilating Co. has been awarded the heating and ventilation contract for both new school buildings at McKeesport, Pa., by the Board of Education.

The "Ideal" turkey sent us just before Thanksgiving was appreciated. Like many others we did not forget the stuffing but were pleased to note a few of the good points which distinguish the Ideal boiler. Thanks, gentlemen.

The Furnace Work Manual is the title of a 268-page book by Sidney P. Johnston, published by Daniel Stern, of Chicago. The book is a compilation of articles from the American Artisan and contains many illustrations. The furnace man will undoubtedly find it of assistance to him. Price $3.50.

Our offer of John H. Mills' "Heat Studies," described on page viii, and our special offer to subscribers, found on another page, present golden opportunities for every one who is interested in heating and ventilation and allied subjects to get books at a price much lower than could be obtained in any other way.

M. Mahony, Troy, N. Y., sends us his calendar for December. Old Santa Claus is just about to disappear down the chimney shown in the upper right hand corner of the card, indicating that he is to give to the inmates of the house such a degree of pleased satisfaction, though of a somewhat different nature, as is obtained through the use of the Mahony boiler.

M. C. Huayett, heating and ventilating engineer, will soon issue a book on Mechanical Heating and Ventilation, which promises to be a valuable acquisition to engineering literature. The author analyzes mechanisms and methods, treating the matter from the standpoint of a critical engineer. He states that nothing of value to architects, engineers and the general public has been knowingly withheld, tables, rules, reliable data and examples being given for the purpose of making a true basis for general engineering practice. The book will contain from 125 to 150 pages and will cost $5.

Interior Decoration is the title of a valuable book published by W. T. Comstock, 23 Warren street, New York, which should be in the hands of every architect in the country. The book is written by Arnold W. Brunner and Thomas Tryon, architects, and is handsomely illustrated, 65 illustrations being given. The aim of the authors has been simply to touch upon the principal points that arise in connection with the subject, and to present suggestions rather than definite instructions on decorative questions. The work takes up the hall, the staircase, the library, the parlor, the dining-room, the study and the bed-rooms. Price $3.

Hodge Bros., of Boston, report an increased demand for their Eureka air valve; in fact the demand has been so large that it got beyond their limited capital, and they have been obliged to place its manufacture and sale into the hands of a company with larger capital. They have made arrangements with the American Pin Co., of Waterbury, Conn., to handle its output, and respectfully refer all their many patrons to them, knowing that, under the new management, the excellence of workmanship, material and finish will be fully maintained as in the past. With their unlimited capital the output will be largely increased and all orders promptly filled. Under the new management the valve will be sold to dealers only, and a continuance of the patronage of the trade is solicited.

The Foster Ball Valve described elsewhere in this issue, is not designed for that class whose sole requirement is small first cost, and who regard such a condition alone as constituting cheapness, but is intended for that class of trade which demands a strictly first-class article. The valve is absolutely guaranteed for five years, and with a 4-inch float and 10-inch lever a valve as large as 6 inches may be operated perfectly. The simple adjusting device by which the float may be adjusted at any angle obviates the necessity of bending rods. The valve stem is fitted with a standard size patent disk, or, when preferred, with a leather washer, either of which can be renewed at a nominal cost: but as the water does not come in direct contact with either seat or packing, the wear on these, or, in fact, on any portion of the valve, is scarcely appreciable.

The Queen Thermometers described on another page of this issue, being provided with season tubes having lens or magnifying faces, will not change their readings with age, and the lens greatly facilitates the reading of the mercury column. The cases are made in two parts, the upper portion in which the scale and tube are fastened called the thermometer proper, and the lower portion, or mercury bath. The mercury bath is separable from the thermometer proper, and serves three purposes: first, it protects the delicate glass thermometer bulb from knocks, dirt, etc., and being filled with mercury, which is a good conductor of heat, it causes the thermometer to be very sensitive; second, in case of breakage or trouble of any sort, it being separable from the thermometer proper, the latter may be lifted out of it and tested, or replaced by another one without shutting off or emptying the system; third, in putting the thermometer on heater or pipes, should it not face in the proper direction, the set screw *A* may be loosened and the thermometer proper carefully turned round. Care should be taken to see that the screw is made fast again. The thermometer parts are interchangeable and the thermometers are as strongly constructed as is consistent with accuracy and sensitiveness. The advantages which the thermogauge shown by Fig. 3 possesses over the ordinary steam gauge, is its absolute accuracy and durability. The manufacturers publish several thermometer circulars, any of which will be mailed upon application, mentioning HEATING AND VENTILATION.

The Powers Regulator Co., 36 Dearborn street, Chicago, are installing their apparatus in the new school building at 104th street, New York City.

The Western Society of Engineers, 51 Lakeside Building, Chicago, have our thanks for the proceedings of their 321st meeting, November 7, 1894.

The Holland Radiator Co., of Chicago, report a recent sale of three car loads of steam radiation for the Lenox Building, at 56th street and Cottage Grove avenue, Chicago.

Charles A. Lathrop, New England agent for the A. A. Griffing Iron Co., reports a fairly successful season and a good demand for the Littlefield steam trap made by the company.

Graham Watts, Honesdale, Pa., has secured the contract for heating by steam the sheriff's house and jail at that city, using the No. 3 Standard steam boiler manufactured by Giblin & Co., Utica, N. Y.

The Standard Radiator Co. of Buffalo, N. Y., report that in the 3,000,000 feet of radiation manufactured by them during the last year, but five leaks have occurred, which is certainly a splendid record.

J. P. Dugger, secretary and treasurer Kewanee Boiler Co., Kewanee, Ill., states that their business is greatly increased, and sales of their boilers at the present time are three times as great as at the same time last year.

The Lowell Heating & Plumbing Co., Lowell, Mass., have removed from 43 East Pine street to 828-836 Middlesex street where they have plenty of room to show up the large line of furnaces, ranges, and plumbing and heating supplies which they carry.

Thos. W. Weathered's Sons will move from their present quarters, 244 Canal street, to 141-143 Centre street, about the middle of January. The new location is in the Cornell Building and will give them better facilities, and will be in a location where the out of town trade will readily find them.

The Foster ball valve made by the F. W. Foster Mfg. Co., of Boston, has been received with great favor. The valve has proved itself a remarkable one on all pressures. Every plumber should send for circulars. Mention HEATING AND VENTILATION. He will be well repaid for the trouble.

The furnace pipe manufactured by the Excelsior Steel Furnace Co., of Chicago, and described on another page, is made so that the small end of each section will slip into the large end of any other section. The pipe which the company mainly keeps in stock is in 5-foot 8-inch lengths, though other lengths are furnished.

The John Davis Co. and the L. H. Prentice Co., of Chicago, have assumed control of and will work together in the introduction of the Paul steam system in Chicago and such other territory as would naturally be handled from that location. They already have some installations working, and arrangements are in progress for introducing the system into a large number of plants this winter.

The Chicago Regulator Co. is the name of a new corporation that has begun the manufacture of a line of engineering specialties at 96-100 North Clinton street, Chicago. The leading device is Wright's pump governor for controlling elevator, sprinkler and other steam pumps. Other specialties are the Nagle temperature regulator for controlling the draft and check dampers of hot water heaters. Mr. Robert Forsyth, late of the firm of Wheeler & Tappan, is at the head of the company.

The plant of the Armstrong Mfg. Co., Bridgeport, Conn., is one of the largest and most complete of its kind in the United States. This concern manufactures an extensive line of water, gas, and steam fitters' tools of uniformly high grade, and noted for their time and labor-saving qualities. The improved pipe threading and cutting-off machines, for hand and power, made by the company, are especially popular, and there has been a steady demand for them during the year now closing.

The leading master steam fitters of New York City are discouraging advertising in programs, engineers' hand books, or in society, church, fair or other similar publications. This, in line with the editorials appearing in HEATING AND VENTILATION some little time ago, is certainly the right position to take, as there should be no comparison in any manner with journals which are spending thousands of dollars each issue in placing before their readers matter calculated to secure *actual* advancement of the trade.

T. G. Haywood, manager of the Chicago office of the Niagara Radiator Co., is agent for a splendid line of quick opening steam and water radiator valves manufactured by the Detroit Lubricator Co., of Detroit, Mich. Their new valve for radiators is similar in appearance to their hot water valve, but entirely different in construction. It is closed by a downward movement of the wheel stem and securely locked by a slight turn of the wheel to the right, being opened by a left hand turn, raising the stem. These valves are made with Jenkins' disks or not, as desired.

The Paul Steam System Co., of Boston, have arranged with H. D. Crane to handle their system in Cincinnati and such territory as can be conveniently handled from that point. Mr. Crane recently made a very extended trip through New England, making a thorough examination of the workings, merits, and benefits to be derived from the use of the system both as regards manufacturing establishments where the ordinary system is used for heating, and where the blower system was in use, and also as regards its merit in paper-loft drying work, the outcome of the trip being the arrangement noted above.

C. F. Fischer, 1334 Park street, Alameda, Cal., has been awarded the contract for heating the offices of the Pacific Coast Steamship Co., in San Francisco. The Yale heater is to be used.

The Gurney Heater Mfg. Co., of Boston, having found it more expedient and effective, will hereafter tap all their radiators for hot water (both Gurney and Yale Quintet) to flow at top and return on bottom, opposite ends, unless otherwise desired.

The Dixon Crucible Co., Jersey City, N. J., manufacture a belt dressing and leather preservative which should be of interest to every one of our readers who uses belting. Circulars will be sent free to any one interested by mentioning HEATING AND VENTILATION.

S. B. Sexton & Son, 511 West Conway street, Baltimore, Md., are the manufacturers of the original Baltimore fireplace heaters, and also of a line of stoves, furnaces, and ranges which have been in the market for years, and which have given general satisfaction. They will be glad to send their circulars to all interested.

The Western Society of Engineers favored us with a complimentary ticket for an excursion to the industrial works of South Chicago, including the plants of the Illinois Steel Works, Iroquois Furnace Co., Chicago Ship Building Co., and Modern Fog & Crossing Co., held November 17, which we desire to acknowledge with thanks.

Walter E. Mellinger, formerly associated with the Baker & Smith Co., of Chicago, in the capacity of heating engineer, has severed his connection with that company to become president and treasurer of the Southern Heating Co., of Louisville, Ky. Mr. Mellinger has the best wishes of his many friends for the success of his new venture, and we bespeak for him the hearty support of the trade.

The Peck-Williamson Heating & Ventilating Co., formerly the Bennett & Peck Heating & Ventilating Co., of Cincinnati, O., send us their catalogue entitled Warm Homes in Wintry Winds and Frigid Climes, giving description and information relative to the Favorite warm air furnace. This is a manual for salesmen and local agents, entitled catalogue "A." The company are issuing two other catalogues, one called "B," What Experience Teaches, another called "C," describing heating, ventilation and sanitary work in public buildings. Catalogue "A," which is just out, is very finely printed, illustrating all their new improvements, and will be sent upon application, mentioning HEATING AND VENTILATION.

The Annual meeting of the American Society of Heating and Ventilating Engineers will be held in New York, beginning Tuesday, January 22, 1895. The programme for the meeting, which is now in preparation, will include the reading and discussion of scientific papers by prominent engineers of the society, topical discussions, and discussions of problems involved in the practice of modern heating and ventilation. The visiting and inspection of prominent heating and ventilating plants in and about New York City will be one of the features of the meeting. The Board of Managers of the society has concluded arrangements whereby its headquarters, after December 1, 1894, will be located in the commodious and finely appointed building of the American Society of Mechanical Engineers, at 12 West 31st street, New York City, a fine library, reading-room, assembly hall, committee rooms, etc., and an excellent service being secured to the society and its members.

The Locke Regulator Co. Salem, Mass., send us their new catalogue of steam appliances, among which are included the Superior damper regulator, steam and water pressure regulators, steam traps, globe valves, check valves, reducing valves and back pressure valves. They are also manufacturers of Locke's "Beats All" pump governor and Locke's water pressure regulator for reducing pressure in city water mains or service pipes. This regulator is the result of over 25 years' experience in water regulation, and will please every one in need of a good valve to cut down the pressure. The "Beats All" pressure reducing valve will maintain one pound of steam, or a vacuum at any pressure. The company claim that their pressure regulator has no equal as a back pressure valve, and they have some very fine testimonials from the leading insurance companies regarding their pump governor for fire pumps, elevators, etc. The Old Reliable steam pressure regulator, to be used where live steam is to be supplied to exhaust pipes, is in use in many of the leading manufacturies of our country. The many other specialties in this catalogue will well repay the fitter for writing for it, mentioning HEATING AND VENTILATING.

At a special meeting of the directors of the Walworth Manufacturing Co., held on the 24th day of November, 1894, it was

Resolved, That in the death of our late president, Caleb Clark Walworth, which ocurred on the 22nd inst., we have sustained a loss that time can hardly repair.

As a man of sterling integrity, rare business ability and inventive genius, having been prominently instrumental in bringing the business and name of the company to its present high standing, he was a constant example to us all. We sincerely regret that during the past two years we have been deprived by sickness of his influence and advice, and we shall ever miss his genial companionship, the pleasant smile which was like a benediction, and the hearty co-operation, which he accorded to each and every one of us.

Many who needed his help will long remember his open-handed liberality, and his kindly words and wise counsel will ever be cherished by those who never called upon him in vain for sympathy or advice.

Resolved, That these expressions of our sorrow at his loss, and our appreciation of his character be spread upon our records and a copy of the same sent to his bereaved family.

J. E. Holland, of the Holland Radiator Co., denies the report which appeared in one of our western contemporaries to the effect that the Holland radiator plant at Bremen, Ind., had been sold to Chicago and Indianapolis capitalists, who were to take charge of the concern and enlarge it sufficiently to meet the demands of the trade. The statement that the old company did not have sufficient capital to carry it along, and were forced to sell, is untrue.

L. J. Wing & Co., 109 Liberty street, New York City, the well known ventilating contractors, have issued for free distribution a very ingenious stamp case, made of hard rubber and suitable for pocket use. On one side is the "Newton Calendar" condensed into the space of one inch, but at a single glance one can tell instantly the month, date and day. On the other side the advertisement of the company appears. It's worth sending for and can be had free by subscribers to HEATING AND VENTILATION.

The Correspondence School, of Scranton, Pa., is thus noticed in Industry of California: "It is the most original agency for technical education that has ever been devised, capable of the extension that has no visible limit, and portends a time when we will not set off a few of the most fortunate for education, but educate all up to the limits required in the application of the skilled arts. One effect will be to raise the standard of the ordinary courses in the technical colleges and schools, because mediocrity can be obtained at a tithe of the expense and in ways more congenial to most students."

The Barstow Stove Co., of Providence, R. I., have favored us with a unique card, on the back of which is a bag, out of which appear to stick the legs and feet of a turkey. Besides the bag is the admonition, don't forget the stuffing, and in examining the contents of the bag we find an expression of best wishes for a pleasant and enjoyable Thansgiving on a neatly printed circular which reminds us that to commercial success we owe many of the good things of life. The company state that they have occasion to be thankful in this generally dull business year for the fine trade they have had on their Bay State ranges, furnaces and parlor stoves.

J. B. Taylor, for the last 26 years confidential man to the Richardson & Boynton Co., died on Sunday, November 25, at his residence in New York. Mr. Taylor was formerly a metal broker, and entered the service of Richardson & Boynton in 1868, steadily rising to the important position occupied by him at his death. For the last four years he has been ailing, being greatly troubled with insomnia, and with a view to its cure has taken three trips to Europe in that time. He last returned on October 20, feeling, as he expressed it, first rate, but soon the old trouble returned, resulting in his death. Mr. Taylor was a broad-minded business man of excellent judgment, and his death is a great loss to the company. He leaves a widow, one son and one daughter.

(*Continued on page xvi.*)

WANTED.

Announcements in this department will be inserted at the uniform rate of twenty-five cents per line. For five or more insertions of the same advertisement we make a discount of 10 per cent. Calculate on nine words to a line.

WANTED.—Several first-class tinners, who are competent to do general furnace work. First-class sober men can have steady employment. Call or address The Peck-Williamson Co., Cincinnati, Ohio.

THE advertiser is in a position to furnish a jobbing house a line of steel steam and hot water boilers of first-class design and make. These boilers are manufactured in a central location and can be furnished at a price to compete with the market. Address HEATER,
Care HEATING AND VENTILATION.

FOR SALE.—Steam Heating and Plumbing business; established fourteen years; only regular heating firm in city of 36 000 people. Must change on account of health. Parties wishing a business already established, address J. C. BIXBY, Council Bluffs, Ia.

SEND THE PLUMBERS' TRADE JOURNAL of 66 Beekman street, New York City, **A CHRISTMAS STORY** for its X-mas edition. You may get five years' subscription by doing it.

AGENTS WANTED

in every city.

50 PER CENT. COMMISSION

for securing new subscribers to ***Heating and Ventilation.*** Exclusive territory given.

The H. & V. Publishing Co.,
146 WORLD BUILDING,
NEW YORK CITY.

THE CELEBRATED SANITAS TRAPS

ENDORSED BY SANITARY EXPERTS AND LEADING PLUMBERS.

SANITAS Traps are used unvented in many of the principal cities of the United States, making a great saving to the Plumber and to the user. The Sanitas is the only Trap that will stand both syphonage and evaporation and hold its seal under the most adverse circumstances. Plumbers interested in giving their patrons the best will invariably give preference to the Sanitas Traps Made in Lead, White Metal or Iron. Send for Special Circulars.

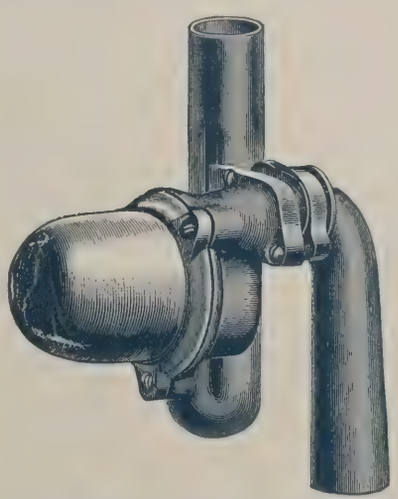


Fig. 9. Sanitas Adjustable Lead Trap, making a Full S-Trap.



Fig. 11a. Sanitas Brass Trap.

Smith & Anthony Co., MAKERS Sanitas Plumbing Appliances.

48 to 54 UNION STREET, BOSTON.

56 BEEKMAN ST., NEW YORK. CHICAGO AGENCY, 217 LAKE ST.

The George P. Steel Iron Co. have removed their office from the Betz Building to 48 North 11th street, Philadelphia, Pa.

The Foster Engineering Co., of Newark, N. J., have entered an order from Messrs. Cramp & Sons, for the equipment of the great American liner St. Louis, with their Foster pressure regulators. The orders for immediate requirements include six 8 inch, which are the largest valves the Foster Company have ever made for steamship service.

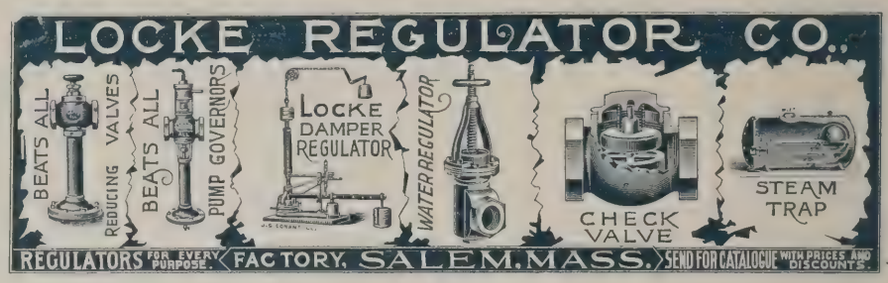
Lewis H. Fisher, the inventor of the automatic damper regulator described elsewhere in this issue, says that on a cold day it requires a much hotter fire to expand the outer tube than on a mild day, the regulator thus automatically adjusting itself to changes in the outside temperature and keeping an even fire in all kinds of weather. The operation is the same when applied to a furnace.

Edward Dewey & Co., 34 Oliver street, Boston, Mass., are meeting with much success in the introduction of their pressure regulators, reducing valves, and pump governors. Their specialties have lately been put in the Boston court house, public library building, city and State hospitals, Harvard college, Yale college, Brown University, and many new school buildings. Mr. Robert Lincoln, the well-known engineer, is manager of the company.

Edward P. Foster is now representing the Electric Heat Regulator Co., of Minneapolis, Minn., in the eastern territory. Mr. Foster was for years with Greene, Tweed & Co., of New York, and is well known in the trade throughout the country. He has been very successful with the Automatic heat regulator, and we cheerfully recommend him to the trade everywhere, and also the specialties handled by him.

We are under obligations to the Chicago Association of Stationary Engineers for an invitation, sent us through The George C. Mickow Co., 65-67 Wabash avenue, Chicago, to be present at their 13th annual ball, which was given at the 2nd Regiment Armory, corner of Washington Boulevard and Curtis street, on Thanksgiving eve, November 28.

(*Continued on page xvii.*)





ABSOLUTELY **K. & M.** FIREPROOF.



MAGNESIA



Sectional Steam Pipe and Boiler Coverings.



THE GREAT COAL SAVER.

MANUFACTURED BY THE

Keasbey & Mattison Co.

Cincinnati: 114 West Second St.
Ambler: Pa.
Cleveland: 117 Water St.

SELLING AGENTS:
New York: Robert A. Keasbey, 54 Warren St.
Boston: S. C. Nightingale & Childs, 134 Pearl St.
Philadelphia: Macan & Co., 1420 Callowhill St.
Baltimore: Wallace & Bro., 432 East Pratt St.
Washington: Wm. B. Morgan, room 19 Builders' Ex.
Chicago: Walch & Wyeth, 208 Lake St.
New Orleans: Delbert Engineering Co., 23 Union St.
Memphis: Symmes & Co., 162 Front St.
Milwaukee: F. Sprinkman, 133 Sycamore St.
St. Louis: F. Bocler, 108 Walnut St.
Detroit: S. P. Conkling, 20 Atwater St., East.

SELLING AGENTS:
Omaha: Spencer Otis, 310 S. Sixteenth St.
Kansas City: J. H. Stoner & Co.
Minneapolis: Arthur L. Otto, Boston Block.
Des Moines: J. C. & R. B. Carter.
Denver: C. W. Badgley & Co., 18th & Market Sts.
Salt Lake City: Utah and Montana Machinery Co.
Butte City, Mont.: R. W. James.
San Francisco: DeSolla & Deussing, 2 California St.
Montreal: Sclater Asbestos Mfg. Co.

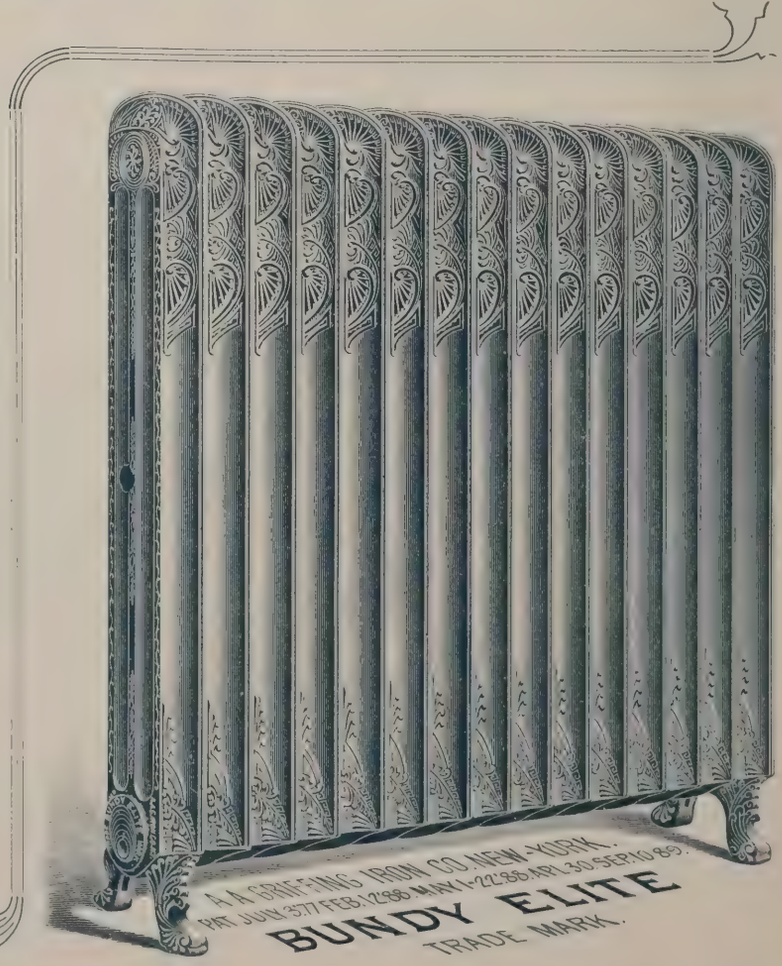
Wide Apart....

Did you say the Elite Sections are?
That's because they are parabolic (incurving)
giving larger air passages between.

THAT'S WHY THE——*

Elite Radiator

is just 25 per cent. more efficient and why 'tis better adapted to withstand internal pressure. The Elite Radiator has three barrels, and there cannot be any water hammering or air pockets, causing those hammering sounds so prevalent where cheap radiators are used. Hundreds have found this out, and so will you if you use the **ELITE RADIATOR.**



Manufactured By . . .

A. A. Griffing Iron Co.,

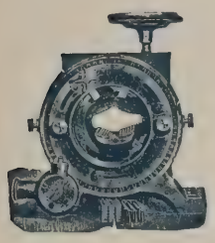
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WORKS:
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NEW YORK,
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. . Send for H Catalogue, mentioning this paper . . . .

A MERRY CHRISTMAS

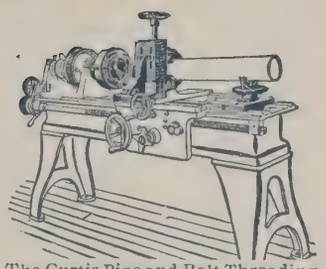


to all our customers and others. You can make it much merrier for us by ordering a pipe cutting and threading machine at once. It will also make your Christmas merrier because it will insure you a saving of much time, labor and money next year. We should be glad to send you one of our catalogues to look over.

Forbes' Patent Die Stock, Pipe Cutting and Threading Machine for Hand or Power. Also Pipe and Bolt Threading Lathe Attachment.

CURTIS & CURTIS, 46 Garden Street, Bridgeport, Conn.

Portable Hand Machines we make enable one man to cut and thread 8-inch pipe.



The Curtis Pipe and Bolt Threading Attachment for Lathes.

Mr. John W. Mills and Mr. A. T. Henderson, of the United States Heater Co., Detroit, made us a pleasant call early in the month.

The Board of Education, Vicksburg, Miss., have contracted with the Peck-Williamson Heating & Ventilating Co., for heating and ventilating and dry closets in their high school building.

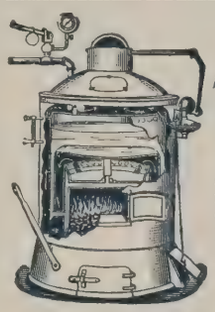
The School Board at Perrysburg, O., after a most thorough investigation, have selected the Peck-Williamson Heating & Ventilating Co.'s system for heating and ventilating and sanitary work in the new high school.

Mr. W. C. Joy, of the New York office of T. C. Joy & Co., has closed with Barr-Reynolds & Co., Rochester, N. Y., for 30,000 square feet of Joy flue radiators, to heat the St. Joseph Seminary, Yonkers, N. Y., of which Wm. Schickele & Co. are architects.

The Union Stove Works, 70 Beekman street, New York, have sent us sections 3, 4 and 6 of their new catalogue. Section 3 refers to an extensive line of sheet iron stoves of various sizes and varieties. Section 4 shows a line of cast iron heating stoves, especially interesting to railroad purchasing agents as well as the stove trade generally. Section 6 shows a line of laundry stoves and tailors' heaters. Send for this catalogue.

(*Continued on page xviii.*)

BIND YOUR PAPERS in our handy binders, it will keep them clean and flat. Stiff board covers, name of paper stamped in gold. Price, 50c., postpaid.
THE H. & V. PUBLISHING CO., World Building, New York.



THE
"PEERLESS"
Steam and Hot Water House Heater.
The Simplest, Cheapest and Best.

A testimonial:

PHILADELPHIA, PA.

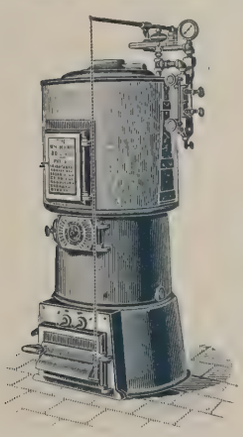
SIRS: We can in all honesty recommend your heating apparatus as superior to any we know of, as we have investigated many. It *Uses Less Coal and Gives More Heat* per ton of coal used with less t ouble than any we know of. Have used it two years without one cent's worth of repairs in that time. Would not do without it for twice what we paid for it.

Yours truly,
G. W BEDDALL,
ED A. BEDDALL,
NATHAN BEDDALL.



Hon. John Wanamaker indorses and is using the "PEERLESS HEATER."

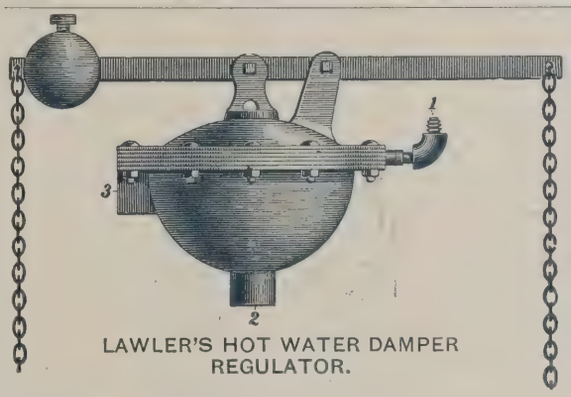
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GEO. H. BELL & CO.,
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AND
ALL RIGHT
The Best and
ONLY
Self-regulating Hot Water Heaters on the market

FOR STEAM HEATING
Manufactured by
The Wm. H. Page Boiler Co., Norwich, Conn.

N. Y. Agents,
DUBOIS & DUBOIS,
61 Gold St.

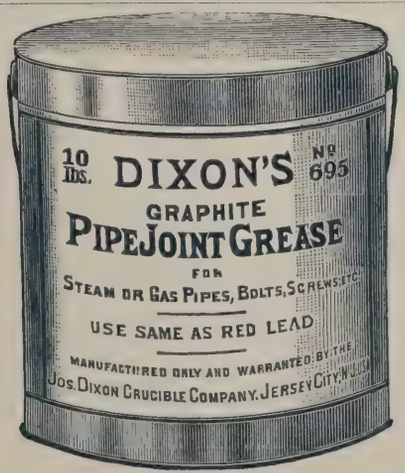


LAWLER'S HOT WATER DAMPER REGULATOR.

This Regulator

Prevents the water from boiling in a hot water heater, and takes care of the fire. It is the best, most simple, most practical and cheapest in the market. Write for description and prices to the

SCRANTON
Steam and Hot Water Boiler Co.,
1335 Capouse Ave., Scranton, Pa.



FAR BETTER AND CHEAPER THAN RED LEAD

Makes a tighter joint than red lead, that can be opened with perfect ease many years after.

Invaluable for all steam, gas and water piping, and equally useful for smearing gaskets on flange joints of meters, traps, and for bolts, screws, etc.

JOS. DIXON CRUCIBLE CO.,
JERSEY CITY, N. J.



The Scollay Hot Water Heater

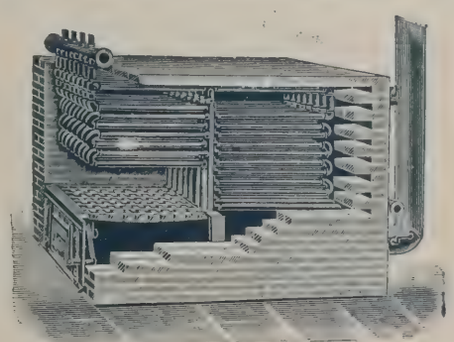
For Warming **DWELLINGS, STORES, OFFICES, CHURCHES, PUBLIC BUILDINGS, &c.**

Also Boilers specially constructed for Greenhouses, Conservatories, Baths, Laundries, &c. . . . . .

Send for Illustrated Catalogue and Price List.

JOHN A. SCOLLAY,
70 & 72 Myrtle Avenue, Brooklyn, N. Y.

THE ELECTRIC BOILER



For Steam and Hot Water Heating

And for Steam Power.

Manufactured in Over 300 Different Sizes.

SEND FOR CATALOGUE
—TO—
THE ELECTRIC BOILER COMPANY,
23 and 25 Stillson St., and
15, 17 and 19 Achilles St., ROCHESTER, N. Y.

A. B. Noyes & Co., of St. Johnsbury, Vt., are heating the St. Johnbury house and the town almshouse with Exeter radiators.

Mr. William G. Snow, formerly with the B. F. Sturtevant Co., is now with the Walker & Pratt Mfg. Co., as engineer. Mr. Snow is a graduate of the Massachusetts Institute of Technology.

The Western Society of Engineers held a successful meeting at the Grand Pacific hotel on Wednesday, December 5. Mr. Goldmarks, paper on "Strains and Deflection in Solid Bridge Floors" was discussed. Dinner was served in the cafe.

An automatic receiver for collecting the condensation from heating systems and delivering it to the pump has been recently put upon the market by the Mason Regulator Co., of Boston. It can be used either with the Mason pump or any other make of steam pump.

Edward E. Parker, Woburn, Mass., has taken the contract for heating the residences of William O'Riley, Frank Meuchen, Chas. Meuchen, and two dwellings owned by Mrs. S. E. Cotton. Mr. O'Riley will keep warm by the aid of a Gurney hot water heater, Richmond steam boilers being used in the other buildings.

Announcement is made by the Superior Furnace Co., of Little Falls, N. Y., that Henry A. Kelley, formerly with the office of 28 Union street, Boston, is no longer identified with the Superior line of furnaces and heaters. All communications should be addressed to the company at Little Falls, N. Y., to all of which prompt attention will be given.

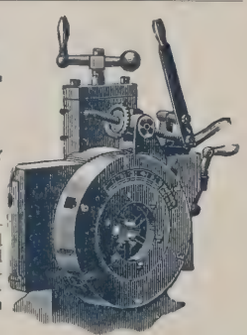
Chief Wade of the Massachusetts District Police, who has charge of the heating and ventilation of all public buildings in Massachusetts, has removed his headquarters to the new State House where both himself and his corps of inspectors have the necessary room, which they have long needed for the transaction of their large and growing business.

The Corry Radiator Co., Corry, Pa., have furnished the radiators for the new Odd Fellows building at Philadelphia, 840 sections of the new indirect having been used. They have also furnished radiators for the St. Nicholas club, of New York, and the Harrisburg State capital building, as well as the new Insane asylum and the new State library at Harrisburg. They are also furnishing the new city hall at Paterson, N. J., the Soldier's Orphan School, at Scotland, Pa., and the almshouse at Trenton, N. J.

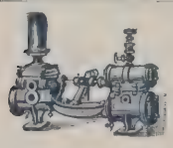
The Gurney Heater Mfg. Co., of Boston, are distributing their annual calendar for 1895. There are two styles of calendar, one showing a merry scene in the woods with a party of young men and maidens in the open, tripping the light fantastic. The other is entitled "The Last Rose," the picture showing a young lady, charmingly attired, resting on a bench and reaching for the last rose on a close-by bush. The whole effect is very sweet. The calendars will be sent free to all who mention HEATING AND VENTILATION.

The Eureka automatic air valve formerly manufactured by Hodge Bros., Boston, Mass., is now being placed on the market by the American Pin Co., of Waterbury, Conn., which concern also manufactures, a line of plumber's supplies including spun floor plates, urinal, stall and closet trimmings, floor clamps, basin clamps, bolts, nuts, chain stays, copper floats and special work in cast, spun, cut, and drawn metal for manufacturers of plumbing supplies. They report trade for the valves very much better than during the same season of last year, the demand being good and the valves giving universal satisfaction.

Bignall & Keeler Mfg. Co.
ST. LOUIS, MO.
MANUFACTURERS OF
Peerless and Duplex Pipe Threading and Cutting Machines.



Quickest Die Adjustment. Dies changed without removing head or face plate. Unequaled in output. **Emery Surfacers, Shapers, Combination Vises.**
Send for catalogue, and mention HEATING AND VENTILATION.
"Peerless" Head showing dies closed.

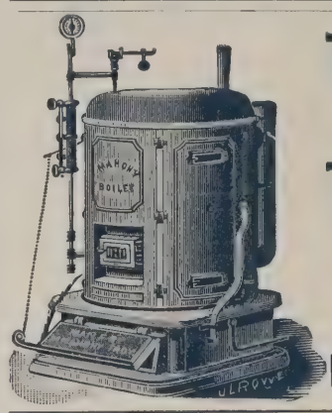


Send for Prices.



VALLEY PUMP CO.
Easthampton, Mass.





New York Office, 36 Park Place

20,000 BOILERS

Just Think
what a line those would make if placed in a row

Think Again!
The 100,000-hp. that we are going to use from Niagara will only heat electrically 7,000 houses,

But the 20,000 Dunning Boilers are heating 20,000 Buildings.

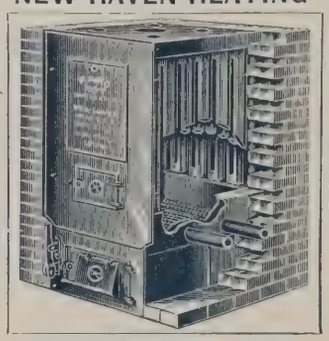
We want to heat more.

We still have a few catalogues left. They tell you all about the DUNNING.

New York Central Iron Works Co.,
298 Exchange St., Geneva, N. Y.

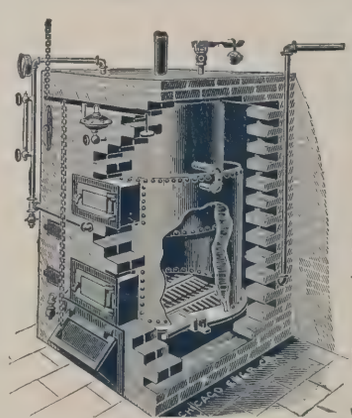
THE MAHONY BOILERS.
For Steam or Hot Water.
THOUSANDS IN USE,
And all Giving Satisfaction.
SEND FOR CATALOGUE.
M. MAHONY, - Troy, N. Y.

NEW HAVEN HEATING AND PLUMBING CO.

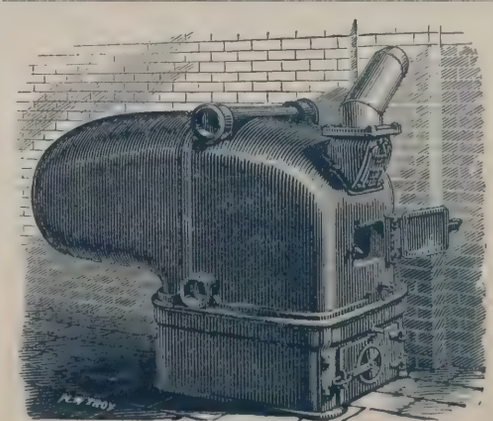


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RAPID
Hot Water Heater
Selling Rapidly To the Trade Only.
Money In It For You.
Send for Catalogue, Price List and Discount.



THE IMPROVED HAXTUN BOILER
FOR STEAM AND HOT WATER HEATING.
ECONOMICAL. *No Tubes to Clog Up.*
Magazine with Front Feed—can use HARD OR SOFT COAL.
BEEN IN SUCCESSFUL USE 18 YEARS.
MADE BY
KEWANEE BOILER CO., KEWANEE, ILL.
Chicago Office. Cor. Dearborn and Lake Streets.
Send for "Haxtun" Catalogue No. 2.



HITCHINGS & CO.,
233 Mercer Street, New York.
ESTABLISHED 1844.
Hot Water Heating Apparatus
for Greenhouses Conservatories, and Dwellings.
ALSO
WATER HEATERS FOR BATHS.
5 Styles of Boilers, 24 Sizes.
Send 3 cents postage for catalogue.



WOOD AND IRON
PATTERNS,
HOT WATER AND STEAM BOILERS,
Originated and perfected at moderate cost of work with no bonus for invention at
VEDDER PATTERN WORKS,
H. CLAY BASCOM, Prop. TROY, N. Y.

H. W. JOHNS' ASBESTOS SECTIONAL PIPE COVERINGS.



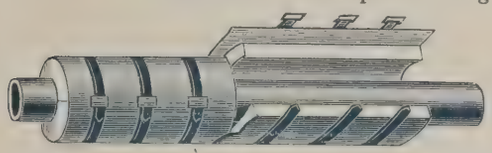
NON-CONDUCTING COVERINGS FOR STEAM AND HOT WATER PIPES, BOILERS ETC.
READILY ATTACHED OR REMOVED BY ANY ONE. ASBESTOS BOILER COVERINGS
WE ARE PREPARED TO TAKE CONTRACTS FOR APPLYING STEAM PIPE AND BOILER COVERINGS IN ANY PART OF THE UNITED STATES.
H.W. JOHNS' ASBESTOS MILLBOARD, SHEATHINGS, BUILDING FELTS, FIRE PROOF PAINTS, LIQUID PAINTS, ASBESTOS ROOFING, Etc.
H. W. JOHNS MANUFACTURING COMPANY,
87 MAIDEN LANE, N.Y. - JERSEY CITY, CHICAGO, PHILADELPHIA, BOSTON, LONDON

MANVILLE COVERING CO.,
MANUFACTURERS OF
Asbestos Cement, Sheep Wool Cement
AND
Sectional Coverings
FOR
HIGH AND LOW PRESSURE
AND
HOT WATER SERVICE.



MANVILLE COVERING CO., 76 3d St., Milwaukee, Wis.
BARBADORE ST., NORRISTOWN, PA.

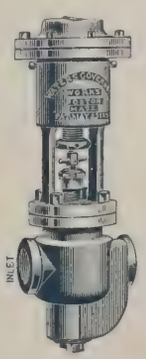
NO. 2. THAT'S US.
See Article on Pipe Covering, Page 7, September issue.



20 per cent better than
Magnesia or Asbestos Sponge
and at prices to meet the times.
New York Fire Proof Covering Co.,
Agents Wanted. 126 Liberty St., New York.



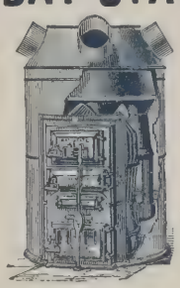
WATERS' GOVERNOR WORKS,
MANUFACTURERS OF
Pressure Regulators, Reducing Valves,
Steam Pump Governors,
AND
Waters' Balanced Lever Valves,
34 Oliver Street, BOSTON, MASS.
"In producing this machine we have been governed by the two best elements in design—simplicity and accessibility. We have endeavored to make an article so simple that any engineer or person of ordinary intelligence can understand and operate it, and, at the same time, should any part get out of order, it may readily be examined and repaired.



THE NESTOR OF FAST PASSENGER SERVICE.

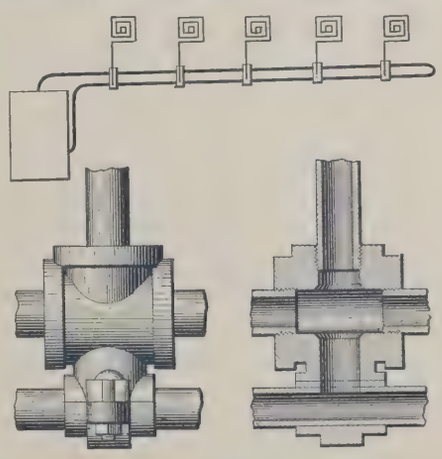
The New York Central System was the nestor of fast passenger service in the United States. Away back in 1878 that road was running "flyers." The "White Mail" was put on in 1876, and ran between New York and Chicago in nearly as fast time as is now made between these cities. This train, however, did not carry passengers, though there was, even at that time, a fast passenger service in operation over these roads. The train was called the "Lightning Express," and made the trip from New York to Chicago in about twenty-six hours. The "White Mail," as it was called, was the admiration of the whole country. Four snow-white mail cars made up the train, and the farmers used to stop work when it passed. Indeed, there was a rumor to the effect that this train only hit in high places. Soon after this the New York and Chicago Limited was put on. This was the first all-sleeper train ever run, and some doubt as to patronage was indulged in by the officials. But this question settled itself. The train paid from the beginning, and it was soon followed by other fast all-sleeper trains. But the other roads have always waited on the Central, and we owe the comfortable train service throughout the country to the enterprise and pluck of the New York Central System.—"*Dixie.*"

THE CELEBRATED
BAY STATE FURNACES

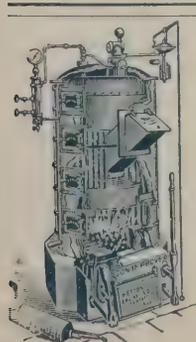


POWERFUL, DURABLE, ECONOMICAL.
Barstow Stove Company,
MANUFACTURERS,
Beekman & Water Sts., New York.
Providence, R. I. Boston, Mass
ESTABLISHED 1836.
Prices, Catalogues, and our interesting publication, "Fireside," mailed on application.

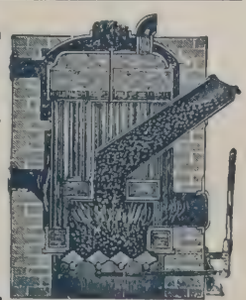
SOMETHING NEW.



"A system of returning water of condensation without cooling supply pipe. Direct route to boiler. Saves steam, saves coal, saves money. Write to
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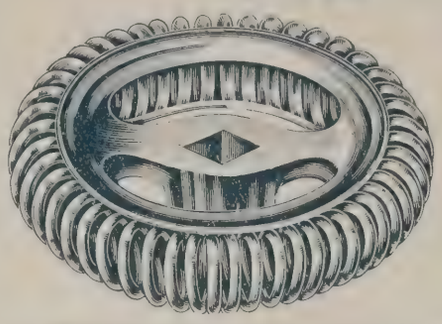
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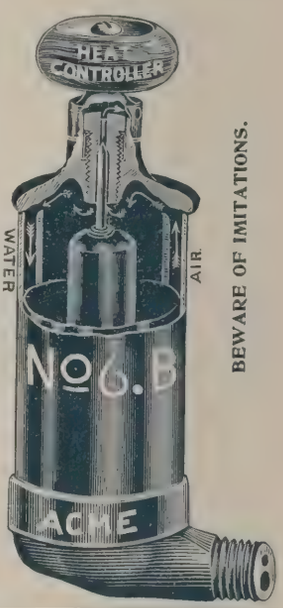
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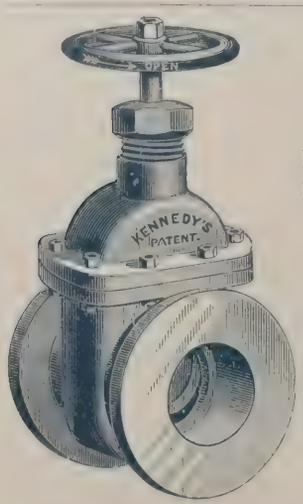
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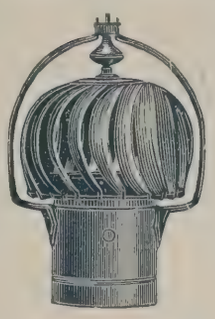
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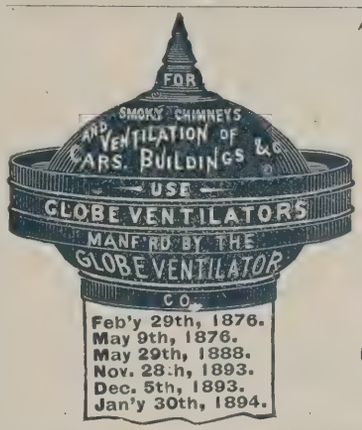
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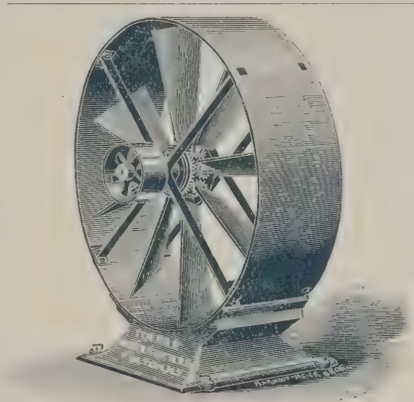
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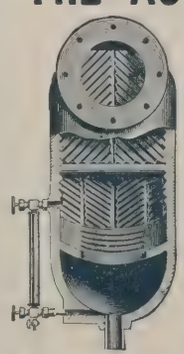
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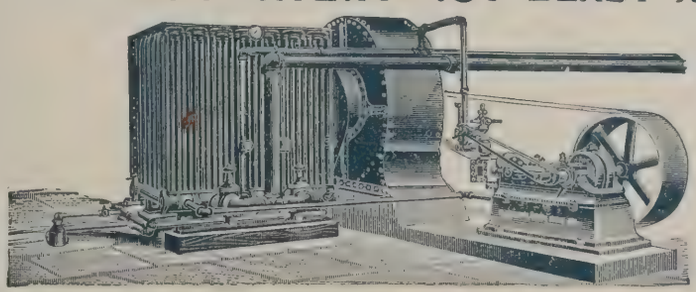
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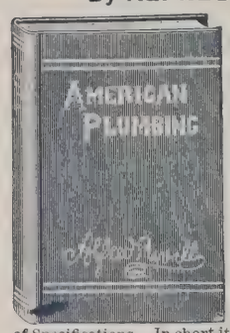
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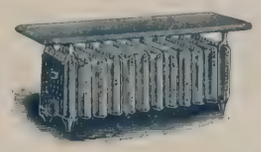
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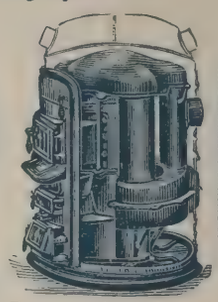


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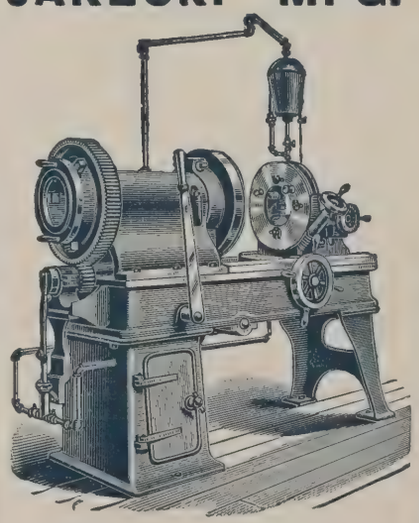
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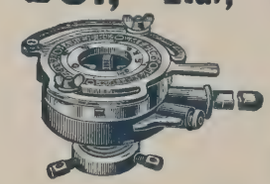
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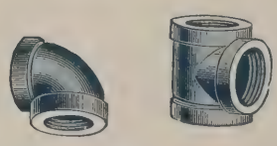
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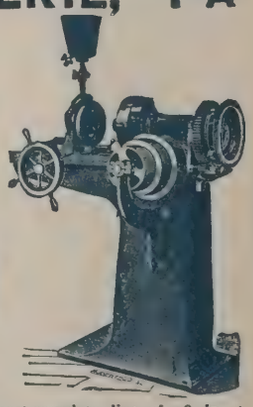


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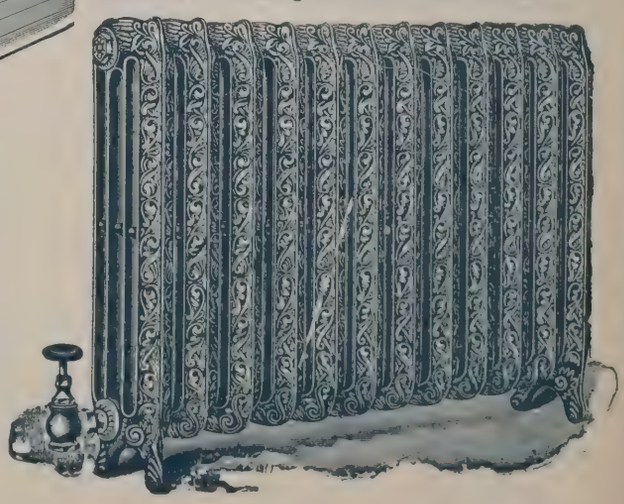
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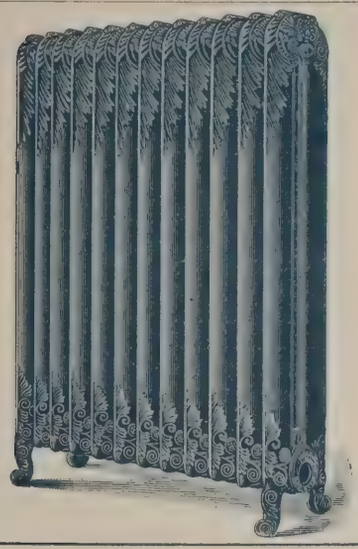
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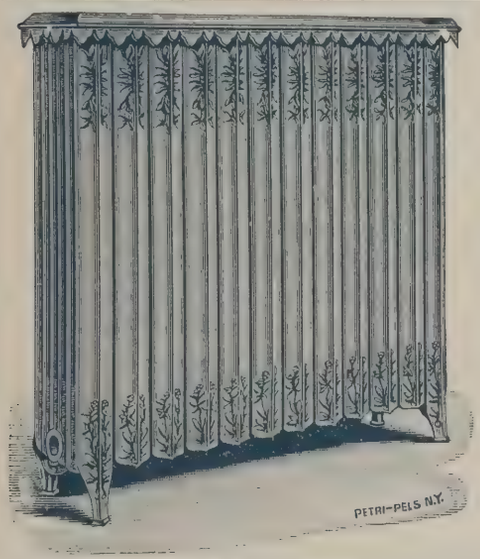
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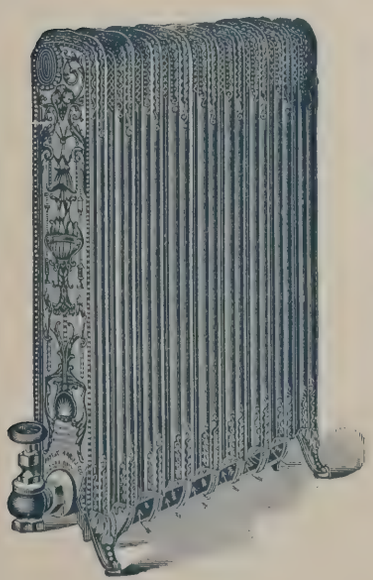
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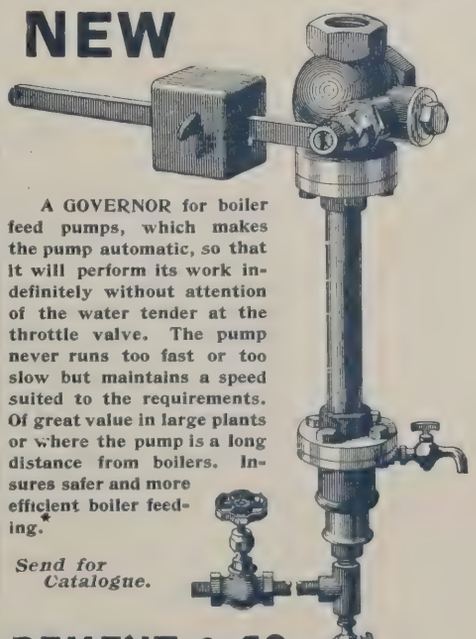
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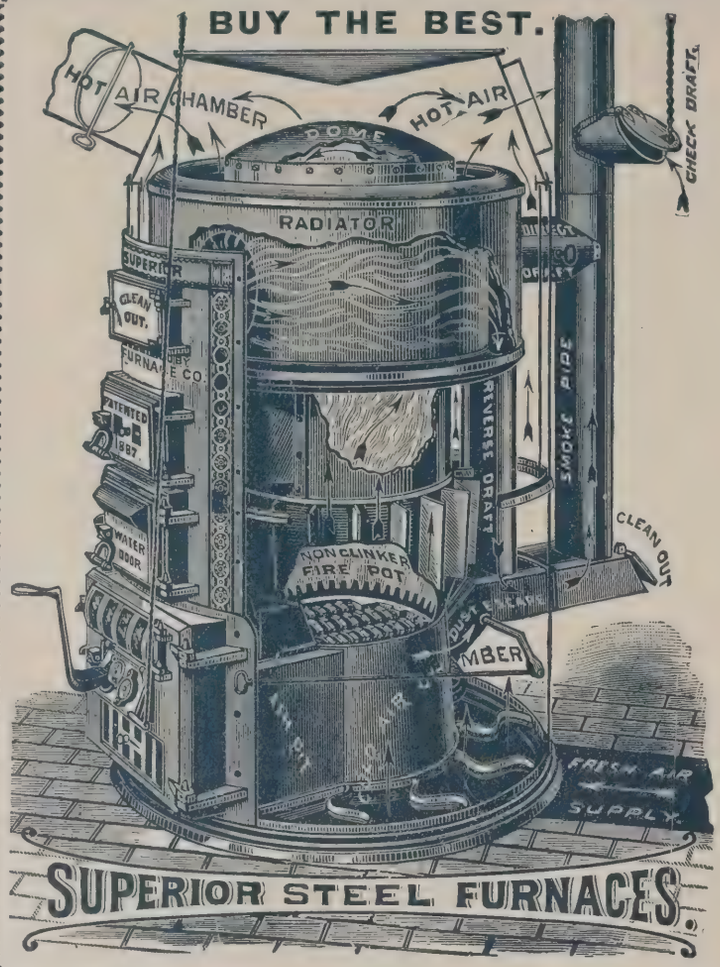


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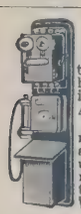
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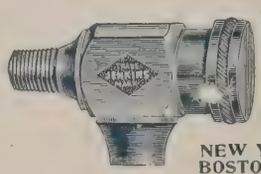


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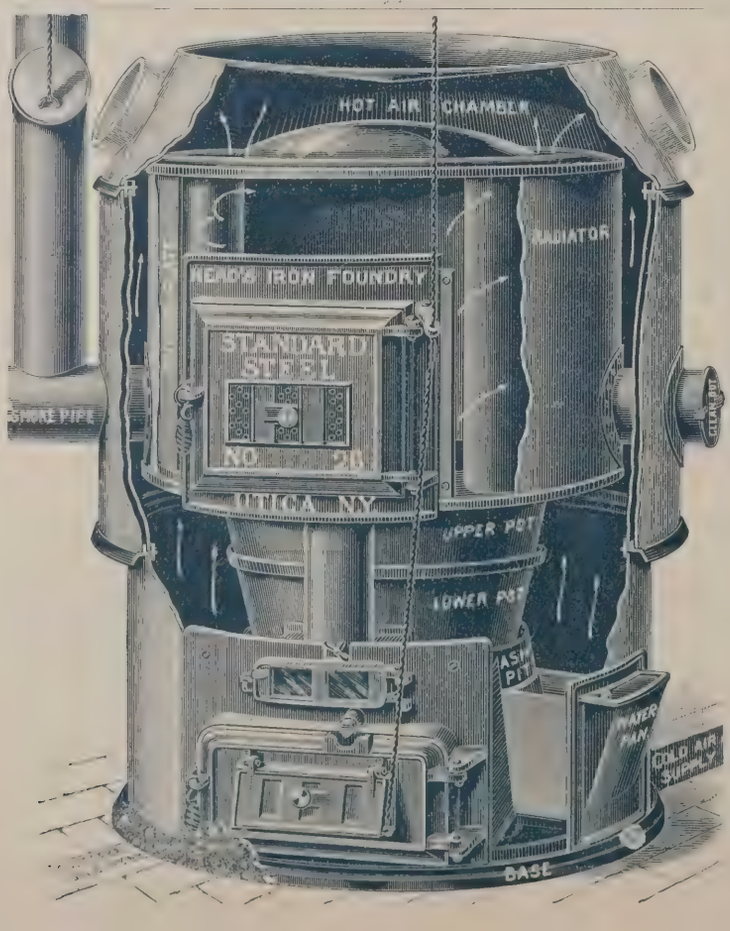
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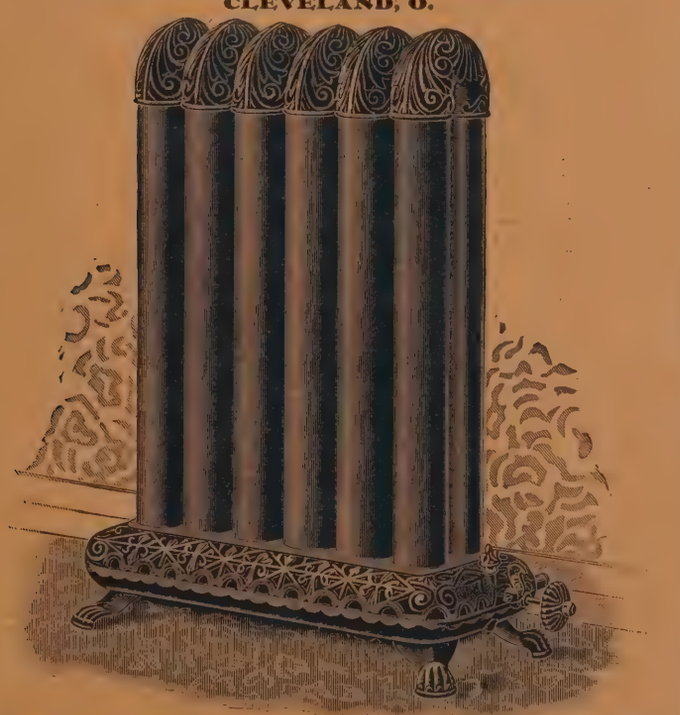
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THE Largest and most Complete line of Radiators and Heaters in the Market. For Quality, Style and Price are unequaled - - - -

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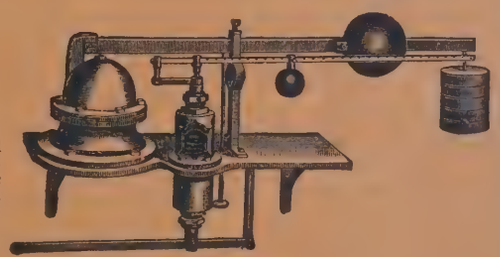
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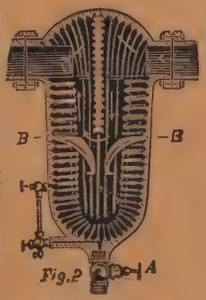
counts for anything, then we are - - - -

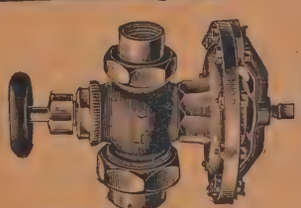
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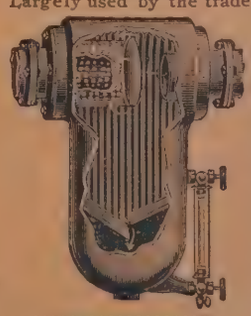






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A good one at a very low price.

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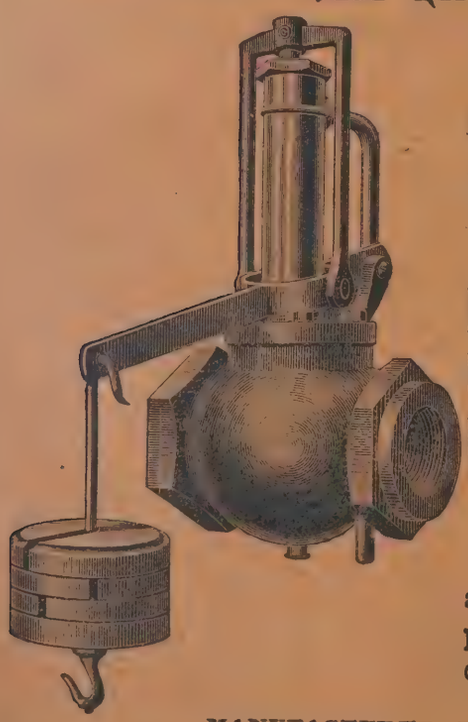
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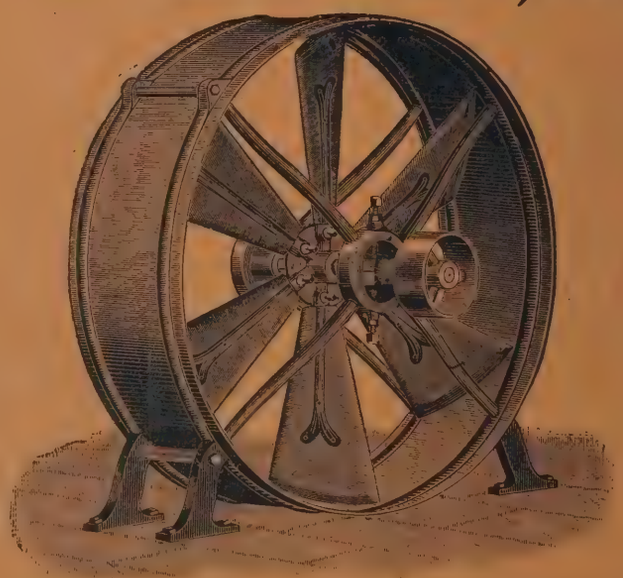
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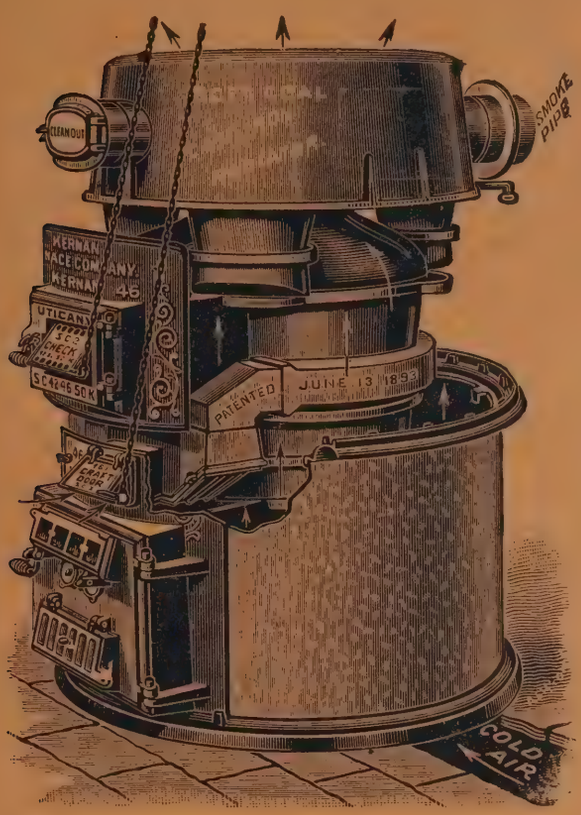
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Tried and Tested.
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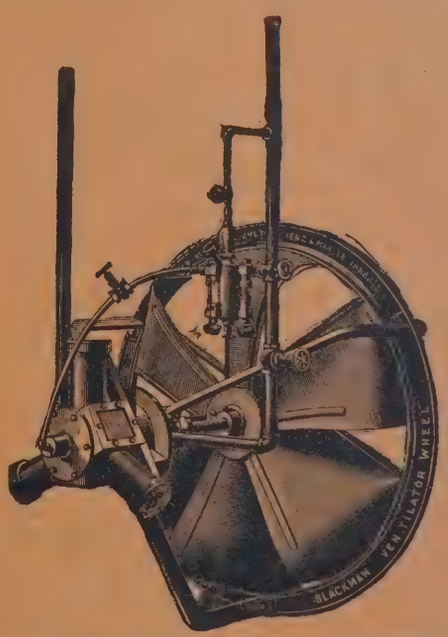
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The Solano Engine attached to the Shaft of the Blackman.



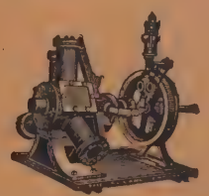
Electric Motor attached to the Shaft of the Blackman. (Front View.)



The Blackman. (Diagonal View.)



The Blackman. (Back View.)



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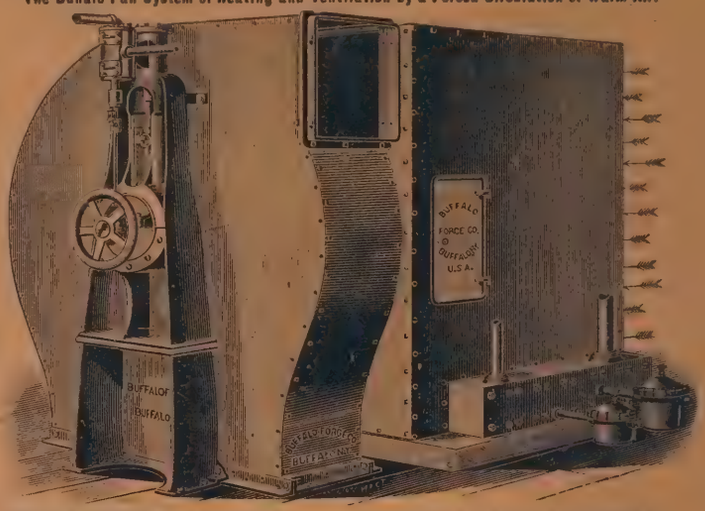
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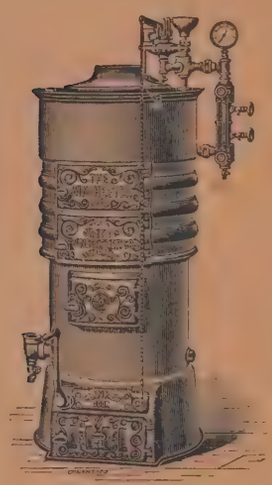
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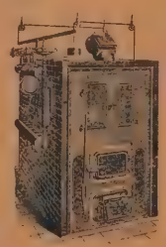
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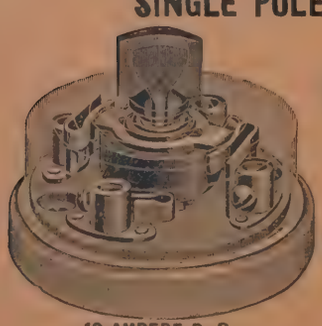
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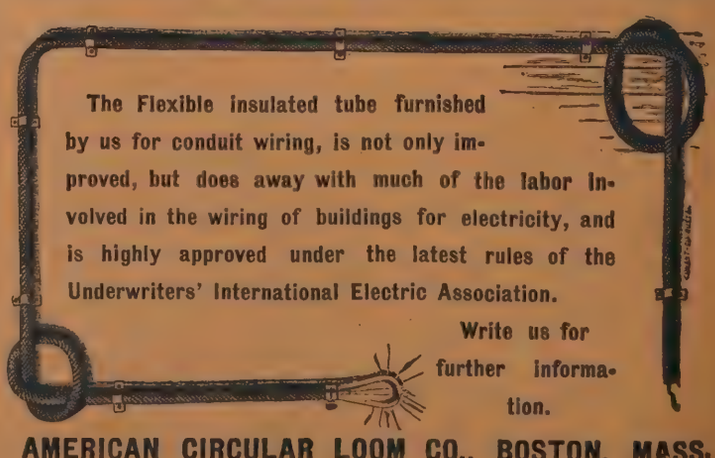
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